the OIL AND GAS JOURNAL
PUBLISHED WEEKLY April 11, 1960

Economy drives made 1959 profitable
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YPF pipeline-story of amazing logistics ▸ 107

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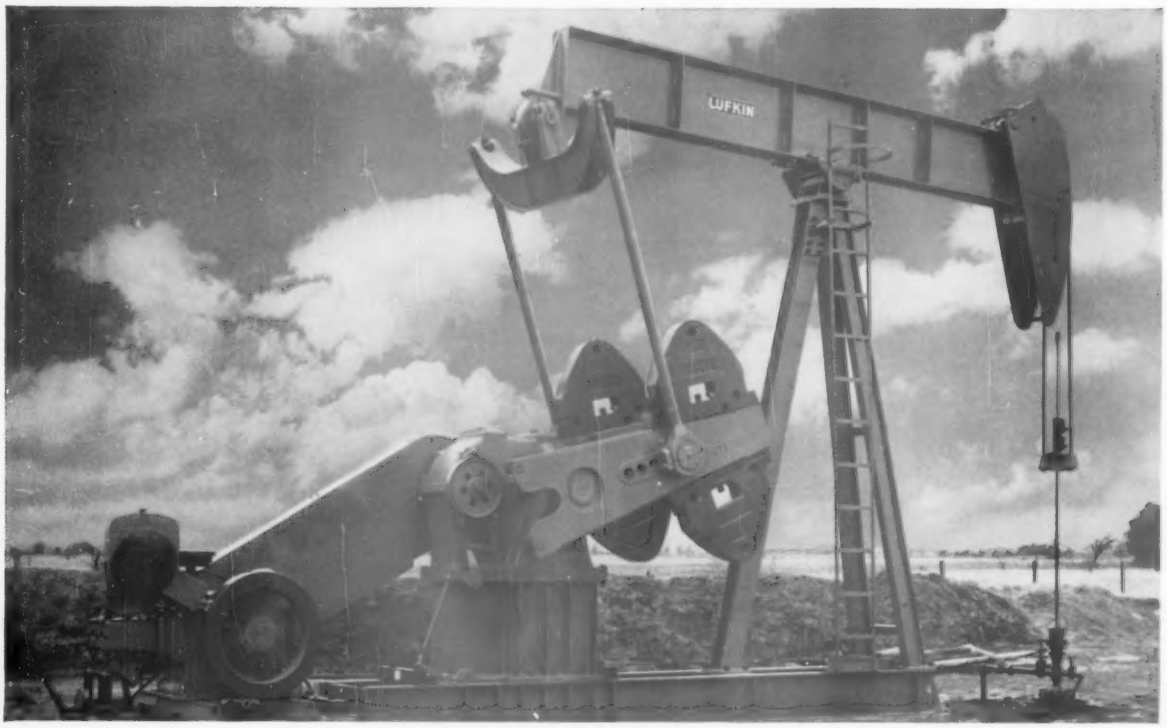
KANSAS readies for a housecleaning
. . . of its outgrown oil laws
p. 77

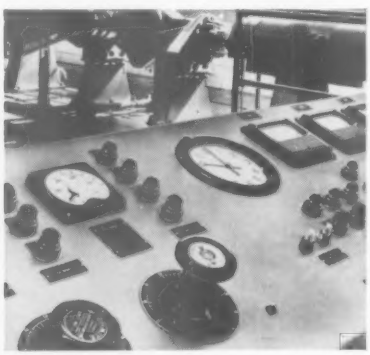
Lufkin reduces friction, cuts maintenance with Timken® bearings on pumping unit crank pins



Since oil field production equipment must run unattended for years on end, Lufkin Foundry & Machine Company engineers specified Timken® tapered roller bearings for the crankshaft and clutch of this engine and for the crank pins of the pumping unit. By using Timken bearings they eliminated shaft wear, crankshaft adjustment and minimized the oil seal problem.

Because Timken bearings hold shafts concentric with their housings, they make closures more effective—keep dirt out, lubricant in. Their tapered design enables them to take both radial and thrust loads in any combination. And because they're made of the finest bearing quality alloy steel available, they can stand up to the continuous, pounding, cyclic shock load of this equipment.

ON-THE-SPOT engineering service helps manufacturers solve bearing problems before they arise. Timken bearing sales engineers are experienced graduate engineers—the pros of the bearing business.



RESEARCH AND DEVELOPMENT, typified by the huge dynamometer above, help keep Timken bearings your No. 1 bearing value. The data it provides helps increase performance of Timken bearings.

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Vol. 58, No. 15

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TECHNOLOGY–OPERATION

Pipelining

YPF Pipeline Is One of World's Largest 107

By Paul Reed

This Campo Duran project in Argentina includes a 1,100-mile 24 and 22-in. gas line and a 900-mile 12-in. products line. Daily capacity for the project is 243,000 M.c.f. of natural gas and 57,864 bbl. of liquid petroleum products.

Production

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By E. T. Guerrero and F. M. Stewart

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By W. B. Bleakley

Operating on a new principle, this pump represents the first radical design change in 54 years. Elimination of conventional ball-and-seat valves gets rid of tendencies to gas lock.

Look at Lease Management for Marginal Leases 125

By S. Russel Casey, Jr.

The lease-management contractor may be able to produce marginal wells at a profit. He can take over the responsibilities for producing these wells and perhaps cut lifting costs, too. Fixed costs can be cut and the advice and knowledge of specialists can be obtained at the same time.

Refining

Refining Piping Work Simplified 115

Humble's Baton Rouge plant insulated and welded piping at ground level and then lifted it by a series of cranes to the pipe band.

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Here are portions of a discussion at a regional meeting of WPRA in El Dorado, Ark., at which experts answer questions on refining.

Drilling

How to Reduce Drilling Costs—Part 3 118

By Preston L. Moore and Carl Gatlin

Six variable factors that affect penetration rate are bit weight, rotary speed, drilling-fluid properties, drilling-fluid hydraulics, rock properties, and bit selection. Proper attention to these factors can result in lower drilling costs.

General

How to Improve Communications from Plant and Yard 111

By Daniel J. Petruzzi

The man down the line will level with management if management levels with its people. Keep him informed—the good along with the bad, in simple language, and he'll feel encouraged to talk. When he does, be a good listener.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
April 11, 1960

Annual reports of oil firms make good reading:

They are showing 1959 a year of moderate profit gains.

The industry has its cost-cutting drive and high-volume activity to thank for this. Otherwise, the narrower profit margins caused by price weaknesses would have cut deeper.

Most firms in 1959 enjoyed near-record volumes of oil and gas production, sales, and petrochemical activity.

Executives predict 1960 will level out yet into a good year, too, and they are betting on a bright outlook for the decade (p. 80).*

▼ ▼ ▼

No doubt about it, IPAA plans to drive ahead in Washington for gas legislation this session.

The independent association has cast aside the twin bugaboos of political year and fear of failure to press for a showdown (p. 92).

The plan:

...Get legislation introduced including basics of removing gas production from FPC control and setting a "reasonable market price" clause.

...Persuade the President to give that legislation his specific endorsement.

...Return to Congress then with urgent request for hearings and action.

Washington beat:

Add two names to the growing list of contenders for appointment to the Federal Power Commission to succeed the late John Hussey:

...O. C. Bailey, chairman of the Arkansas Oil and Gas Commission.

...Harry G. Wiles, chairman of the Kansas Corporation Commission.

Look for this compromise in federal leasing legislation.

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

Congress will eliminate the present waiver of rentals for the second and third year of a lease. Interior will hike the annual rental rates to 50 cents per acre per year.

This is the outlook for residual fuel import quotas: Interior will try to avoid increasing them during the present 6-month period. However, if stocks run low, as expected, the Department may hike the quotas enough for the following allocation period to permit rebuilding of stock levels.

▼ ▼ ▼

Crude oil is weak. April is a turnaround month and crude stocks are building up.

Straws in the wind:

...Purchaser proration is spreading. Rock Island Oil & Refining cut buying to 80% of January runs in Oklahoma. Firm had been buying more than 53,000 bbl. daily. Indiana Oil Purchasing also will continue its proration for another month—same for Sinclair.

...Prices are soft around the edges.

Sohio cut 10 cents a barrel off 1,000 bbl. daily it buys in Stephens and North Stephens fields of Arkansas.

Premier sliced 10 cents off 9,500 bbl. daily in West Central Texas and 5,000 bbl. daily in East Texas field. The new tops are $2.91 in West Central, $3.15 flat in East Texas.

Republic trimmed 5 cents off 12,000 bbl. daily of light crude it buys in the Corpus Christi area, meeting a previous cut made by Southern Minerals.

▼ ▼ ▼

Drilling activity is slowly edging upward.

Total of 1,746 rotary rigs was active last week. That's up 67 from a week ago and up 90 from month ago. But it's still 291 below the same week last year (p. 91).

Texas, Kansas, and Oklahoma all show improved activity in the last month. And it's about time for a spring upturn.

Look for a sharp drilling pickup in Northwestern Oklahoma and Southwestern Kansas late this year and extending through 1962.

Reason: A wave of lease expirations start then and will force holders into drilling deals to prove them.

Brisk development program will start in central and north end of Michigan's prolific Scipio trend when weather improves. Mud has stopped movement, causing 12 rigs to be stacked.

▼ ▼ ▼

Kansas is a good candidate for a wholesale revamping of its oil laws and regulations.

More and more Kansas oil men tell you this. State

officials are inclined to go along with the thought. Under the present crazy-quilt system of rules the result is:

...Good wells penalized by an allowable policy which over-subsidizes poor wells.

...Incentive to cut costs by drilling fewer wells is missing (p. 77).

▼ ▼ ▼

Humble plans to market in Oklahoma this year.

Survey is being made now to see what marketing facilities can be bought. Humble wants to buy in rather than build new and plans a branded operation.

Sign of spring: Total gasoline demand averaged about 4,100,000 bbl. daily for week ended April 1, first time this year for demand to top 4,000,000 bbl.

Another bonus: Refiners got first gasoline-stock reduction of year. Stocks went off about 400,000 bbl. for the week. Stock increases had averaged 2,500,000 bbl. per week in the previous 4-week period.

▼ ▼ ▼

Projects costing more than $1 billion have moved up to the front burner as a result of the Canadian Energy Board's granting gas export permits to four firms (p. 83).

Projects include $600 million in gas-gathering and transmission systems, $250 million for processing plants, and more than $150 million to develop new gas reserves.

The permits allow flow of 6,529 billion cubic feet of gas from Alberta fields into U. S. over next 25 years.

Extension of Yellowstone products line from Helena to Great Falls, Mont., is being planned.

The project will provide pipeline transportation of jet fuel to Malstrom Air Force Base at Great Falls. Yellowstone is operated by Continental Pipe Line for Conoco, Union Oil, Interstate Oil Pipe Line, and Husky Oil.

Deal for a large volume of gas in Woodward County, northwestern Oklahoma, is sought by Michigan Wisconsin Pipe Line.

Offering price is 20 cents an M.c.f., which would be tops in the area if approved.

Ice cubes make a good pipeline cleaning agent.

Union Oil of California found this out by pumping 400 lb. of 4-in. cubes at high velocity through a 3,000-ft. 10-in. line at the firm's Los Angeles refinery.

The frigid cleaner did a very satisfactory job at less cost than chemicals.

Market Memo

April 11, 1960

The East Coast has run out of quota residual imports.

Three majors, with first-half 1960 residual import quotas exhausted, are trying to buy Gulf Coast cargo No. 6. They are willing to pay higher prices—but so far it's no go.

Even offer by bright New York broker reminiscent of the wartime rum and scotch offers has failed to find prompt No. 6 cargo offerings.

His offer: Buy a T-2 of No. 2 at 8-cent posted price if packaged with a T-2 of No. 6 at posted price, both for prompt lifting. In effect, he is offering 21-cent barrel premium for a T-2 of No. 6.

It's elementary that No. 6 is in short supply to meet current East Coast demand.

Consider the figures: Total U. S. No. 6 inventory is 28.73% under same date last year and East Coast inventory is 26.42% under year ago.

Price for Gulf Coast No. 6 is firm at $2.10-2.20 for garden variety and $2.40 flat for low sulfur. Premiums are offered for April-May liftings.

Gulf Coast spot gasoline is in a conflict of interest situation—seller vs. buyer.

The calendar—it's late in Lent—points to firming prices. Inventories and crude runs point to excess stocks. It is a draw with no interest in spot purchases even at ½ to ⅝-cent off posted prices.

Gulf Coast No. 2 is static in demand and price at ½-cent off the posted price.

Midwest markets are the best.

Gasoline from Great Lakes pipeline is up ¼-cent to 11.5 cents per gallon. It's too early to pinpoint discounts, but to volume buyers it's safe to figure ¼-cent off.

Chicago posted markets are up ½-cent with 92 research gasoline posted at 11.625 cents. Discounts for volume of ¼-cent are available.

No. 2 is dead with substantial discounts off postings.

River markets also are firming.

Going gasoline price is ¼-cent off Gulf Coast low f.o.b. West Memphis and Helena.

Middle distillates are moving out of Helena at respective Gulf Coast low postings.

This reverse firming will tend to firm Gulf Coast gasoline if weather starts summer demand.

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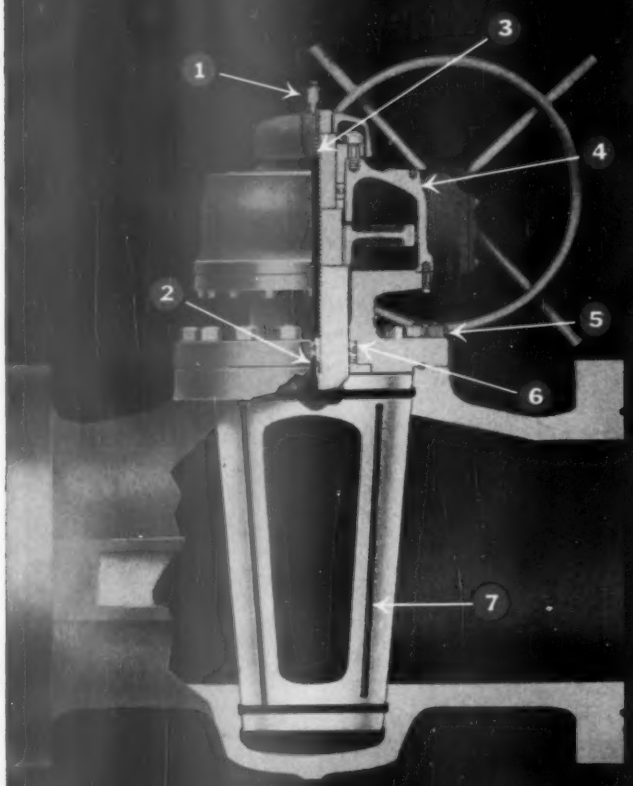

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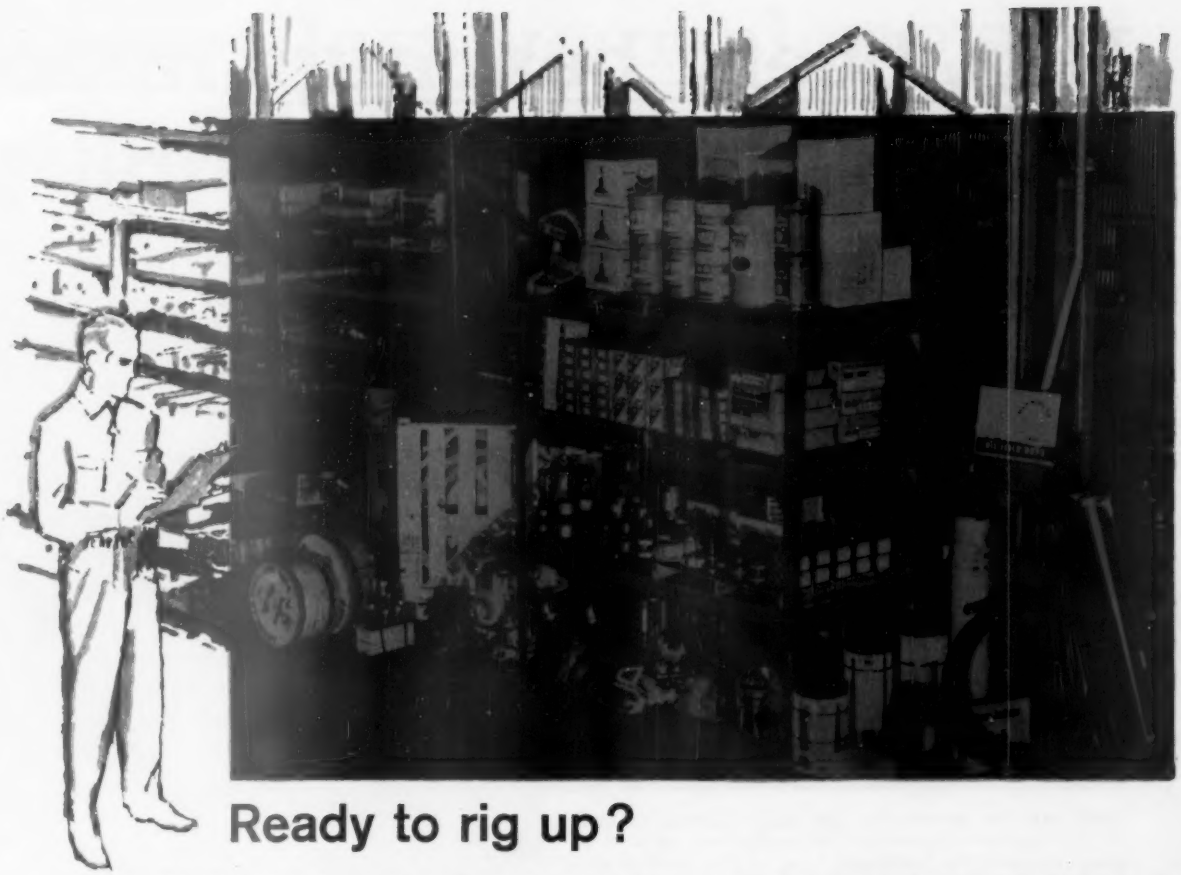

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- Hacksaw Blades
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- Rakes
- Solder
- Shovels
- Swages

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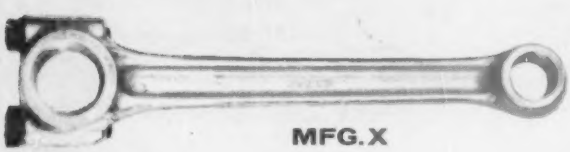

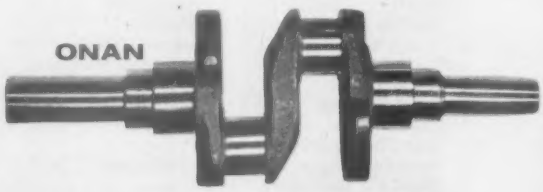

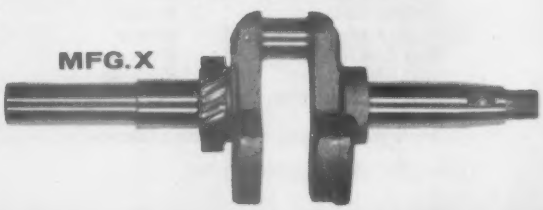

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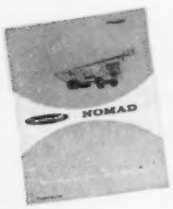

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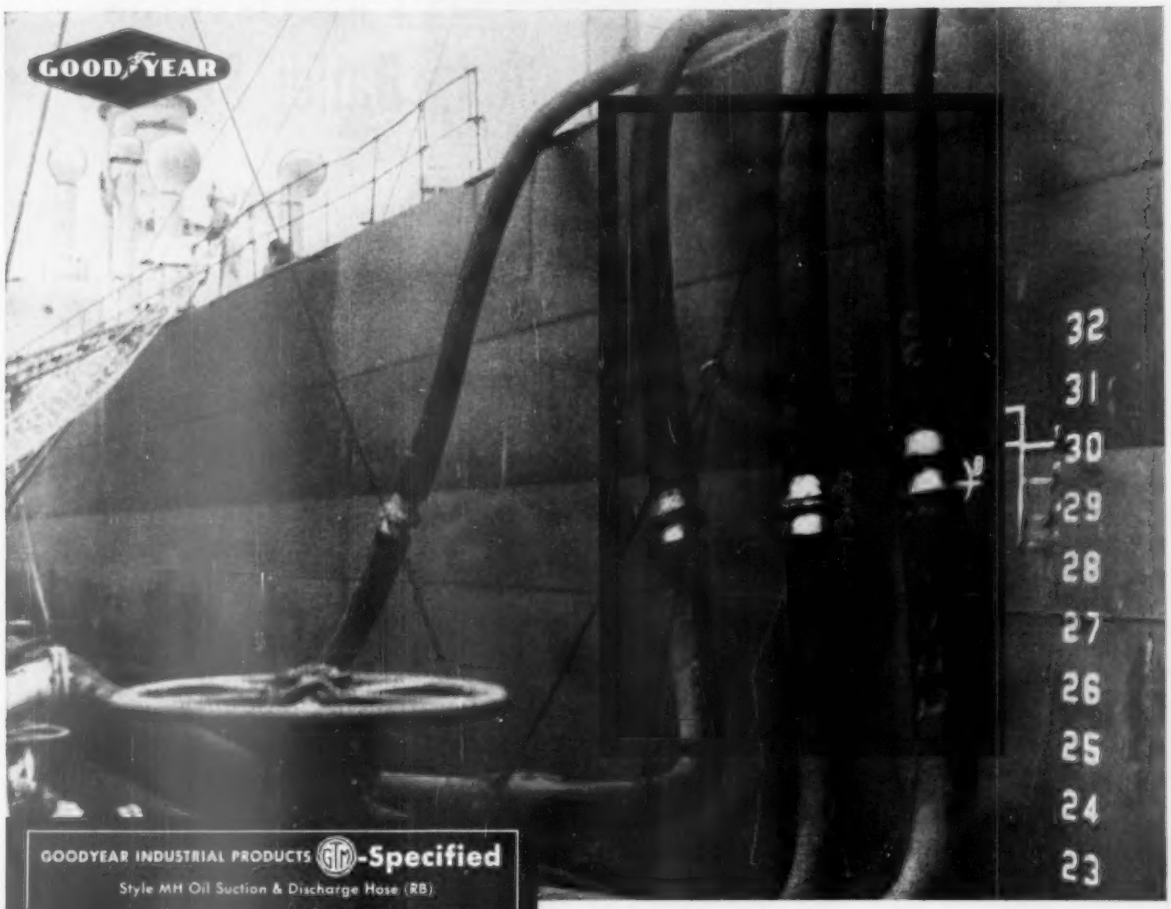
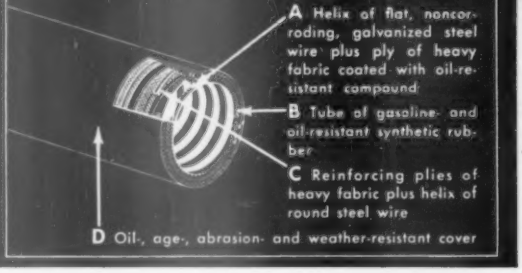
Here's hose designed for the toughest oil-handling jobs at docks and refineries. It's MH Oil Suction and Discharge Hose developed by the G.T.M. – Goodyear Technical Man – and his colleagues. And it's built with a tube of oil-resisting synthetic rubber to carry millions of gallons of oil, gasoline, solvents—even butane. The tough, abrasion-resistant cover can withstand constant dragging back and forth over rough piers and sharp ships' plates. Multiple helices of heavy steel wire guard it against kinking or crushing—multiple plies of heavy fabric armor it against abuse. Here, then, you have an oil-handling hose that will not only serve you longer—but do it at the lowest over-all cost.



GOODYEAR INDUSTRIAL PRODUCTS GT-Specified

Style MH Oil Suction & Discharge Hose (RB)


A Helix of flat, nonconroding, galvanized steel wire plus ply of heavy fabric coated with oil-resistant compound
B Tube of gasoline- and oil-resistant synthetic rubber
C Reinforcing plies of heavy fabric plus helix of round steel wire
D Oil-, age-, abrasion- and weather-resistant cover

The G. T. M. and your Goodyear Distributor are always your best source for any hose used in oil-handling operations.

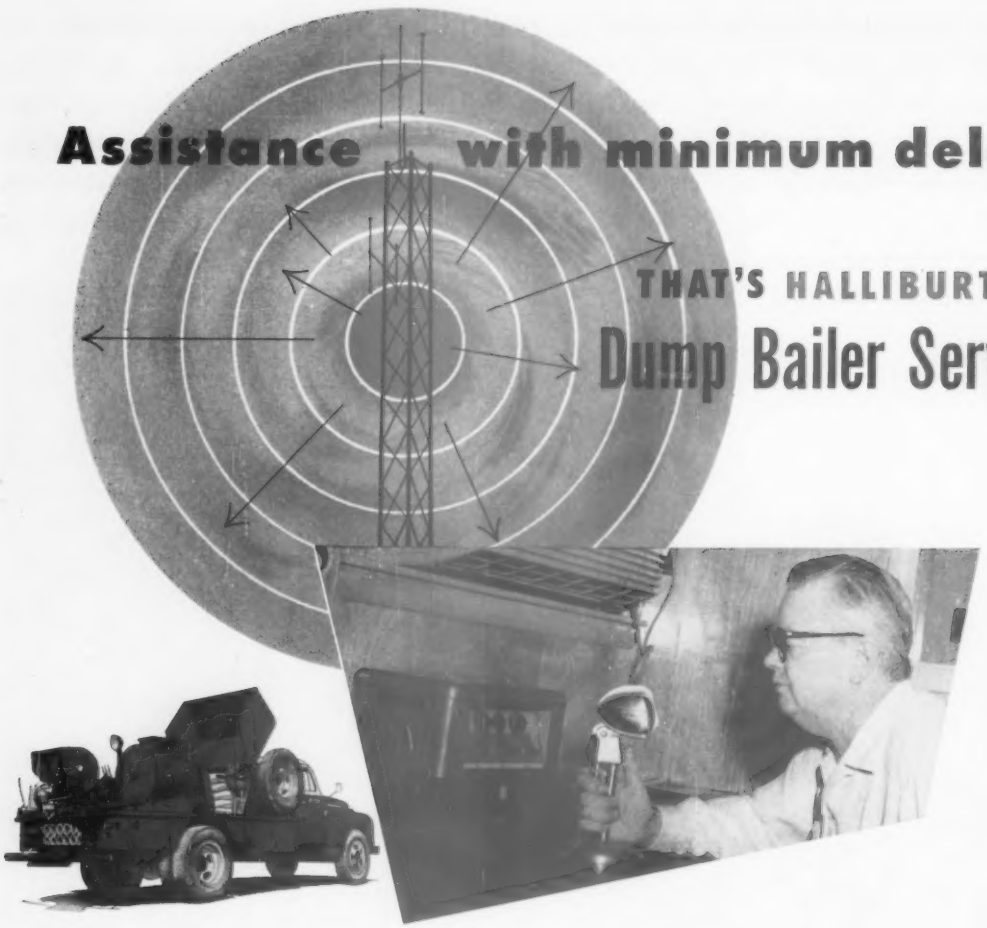
The industry's most complete hose-line also includes the finest hose for everything from drilling wells to filling autos at the pump. To get the G.T.M.-recommended hose for your job, look for your Distributor under "Rubber Goods" or "Rubber Products" in the Yellow Pages. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

lots of good things come from

GOODYEAR

THE GREATEST NAME IN RUBBER

Assistance with minimum delay!

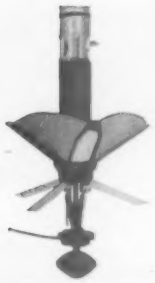


THAT'S HALLIBURTON
Dump Bailer Service

When remedial cementing means the loss of costly rig time, or threatens the loss of production itself, you need assistance with a minimum of delay. That's why it pays to call Halliburton Dump Bailer Service. Halliburton is as near as your telephone; all Dump Bailer Service fleet units are radio-equipped for extra-speedy service... available 24 hours a day.

The continuous Halliburton program of Dump Bailer Service development makes available a wide range of materials and equipment tailored for most job requirements. On jobs requiring—bridges, plugs, water shut-off, aluminum alloy removal, shot tamps—you are assured of prompt assistance... and service that is based on more than 20 years of Dump Bailer experience.

In every phase of remedial cementing operations... tools, equipment, materials, experience, *and* prompt dependable service... Halliburton leads the industry. Call your nearest Halliburton field office for the best and most dependable Dump Bailer Service.



"DB" BRIDGING BASKET

An efficient umbrella type that bridges open holes or casing from 4" to 15" I. D. . . . field-proven in hundreds of dump bailer jobs, the drillable basket has demonstrated its efficiency in wells exceeding 13,000 ft. The "DB" Bridging Basket forms a dumping bridge for additional materials and saves time in isolating formations, locating and repairing casing leaks, squeezing, acidizing and other operations.

CAL-SEAL

A quick-setting, super-strength gypsum cement especially effective for dump bailer jobs such as bridge plugs, split pipe, blowouts and shot tamps . . . Available in three types for controlled setting to meet special conditions, Cal-Seal's 0.3% lineal expansion during setting tightens plug in hole or fissure. Its rapid strength development and low permeability provide a cementing material that is easy to apply, readily drillable and economical to use.

HYDROMITE

A proven waterproof plastic cement, composed of a special gypsum cement and a powdered resin, particularly adapted for dump bailer equipment . . . The setting time of Hydromite can be controlled to very close limits, with the initial set occurring within 75-100 minutes. It will set in temperatures ranging from 60°F to 225°F. . . Unlike a portland cement slurry, the resin in the fluid phase provides an impermeable seal when squeezed into the formation. This feature, together with Hydromite's 0.3% linear expansion during initial set, makes it a tight non-permeable plug for shutting off bottom hole water in producing wells.

RESIN-CEMENT

A blend of resins, water and Portland Type Cement formulated for individual well requirements. Resin-Cement is effective for open hole bottom plugs and may be placed by dump bailer or by pumping. Has application in most oil, gas or water bearing formations, including sandstone or limestone, with temperatures from 80°F to 230°F. . . Set Resin-Cement is permanent in nature and not normally affected by oil, mud, or corrosive waters or gases.

HYDRO-LOK (PC-11)

Hydro-Lok (PC-11), consisting of a thermosetting resin and inert solids used as bulking agents and for fluid loss control, is especially effective for water shutoff. This material is placed like cement slurry and may be dumped with bailer, if desired. PC-11 sets in one to three hours after being placed in the hole; the resin phase which is squeezed into the water formation sets in less than an hour because of the accelerating action of water.

HALLIBURTON

DUMP BAILER SERVICE

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"CONTINUE TO LOOK TO HALLIBURTON—FOR LEADERSHIP"

for ALL oil field power

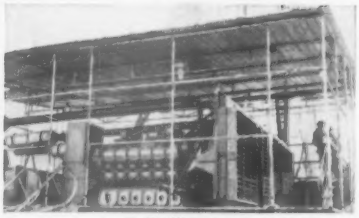
ROILINE ENGINES

- Natural Gas
- Propane or Butane
- Gasoline

SEVEN ROILINE MODELS from 200 to 706 maximum horsepower

Pumping

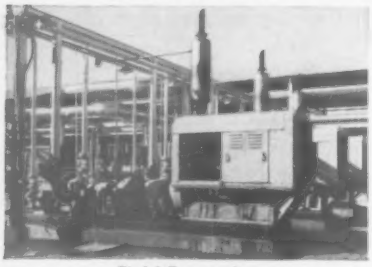
Compressor



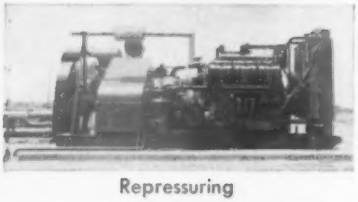
Drilling

Generator Drive

Pipe Line

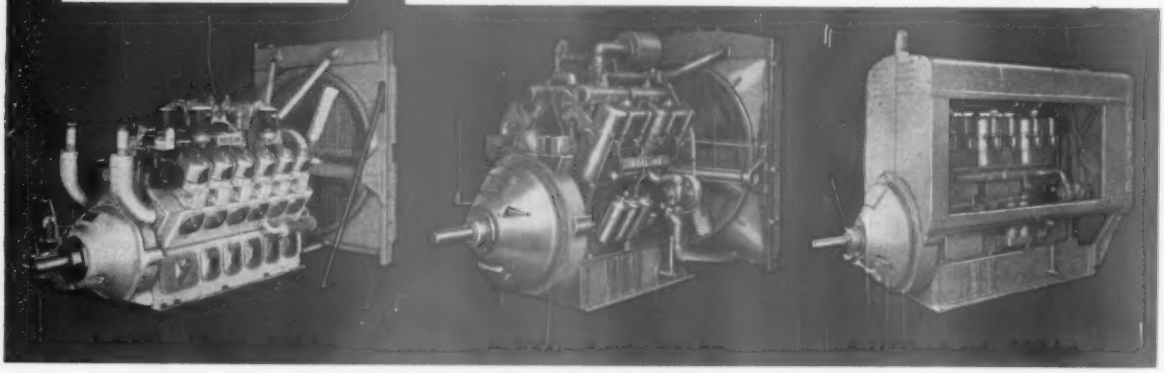


Field Processing



Repressuring

Transport



Write for literature • **SEE YOUR ROILINE ENGINE DISTRIBUTOR** 469-R-C

ARIZONA, Casa Grande, Engine Service Company, Inc.
CALIFORNIA, Long Beach, Engine & Equipment Company
COLORADO, Denver, Emrick & Hill Engine & Equipt. Co.
KANSAS, Garden City, Carson Machine & Supply Co.
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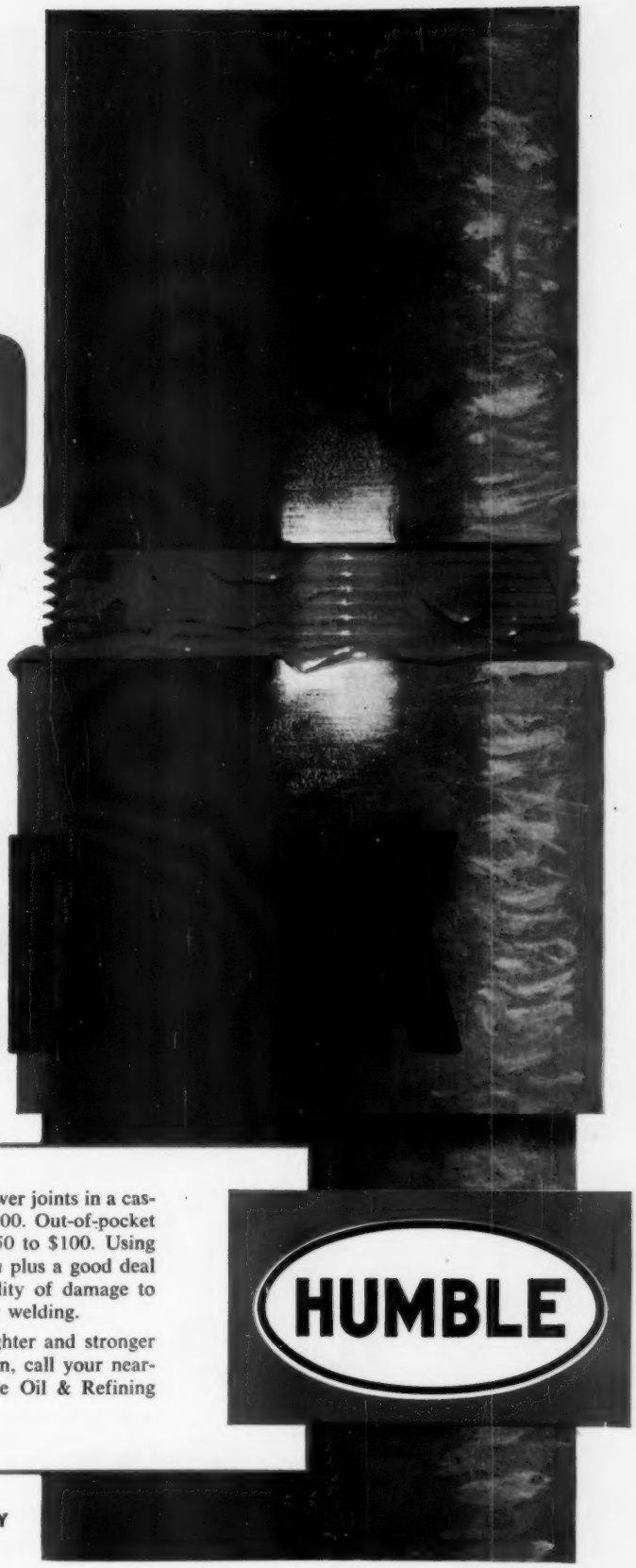
WYOMING, Casper, Emrick & Hill Engine & Equipt. Co.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / New York • Tulsa • Los Angeles
Factories: Waukesha, Wisconsin and Clinton, Iowa

save $40 to $90

Lock your casing

with THRE



Your own crew can lock and seal the lower joints in a casing string with THREDLOK for about $10.00. Out-of-pocket costs of welding would be approximately $50 to $100. Using THREDLOK, you can save $40 to $90 *cash* plus a good deal more in time, and you prevent the possibility of damage to high strength casing that could be caused by welding.

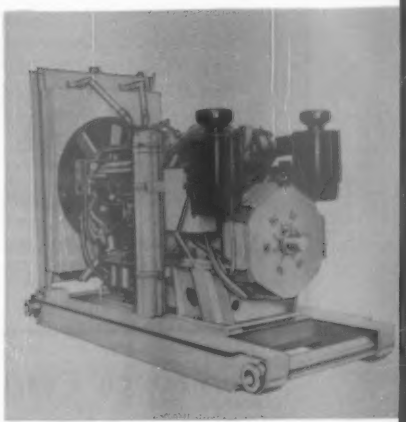
THREDLOK seals and locks joints tighter and stronger than tack welding. For complete information, call your nearest Humble bulk plant, or contact Humble Oil & Refining Company, Houston, Texas.

HUMBLE

HUMBLE OIL & REFINING COMPANY

CUMM
V-12 DI

COST LESS . . . WEIGH LESS . .



Cummins VT-12 Diesel Electric Drilling Unit

Max. h.p.	600 at 2100 rpm
Net cont. h.p. rating	435 at 1800 rpm
No. of cylinders	12
Bore and Stroke	5⅛" x 6"
Displacement	1486 cu. in.
Compression ratio	13.5 to 1
Generator (General Electric)	GT-602A

MINS
IESELS

. . EARN MORE PROFIT FOR OIL MEN!

More than 1 million Cummins V-12 horsepower has been placed in service during the past ten years. The success of the 450 h.p. NVH-12 and the 600 h.p. VT-12 torque converter units for rotary drilling and well completion services is known throughout the world.

Now . . . Cummins makes available a VT-12 heavy-duty electric drilling unit (shown at left) with portability previously unavailable to the industry. This unit simplifies the electric rig for land, mobile or off-shore designs . . . reduces moving and rig-up costs.

Remember this . . . wherever your rig operates, Cummins service is nearby. World-wide sales and service points coupled with manufacturing facilities in Scotland and Brazil eliminate costly delays. That's why you should specify Cummins Diesels —from 60 to 600 h.p.—for all your oil field requirements. Cummins gives you dependability with portability and at a lower initial cost.

CUMMINS

Cummins Engine Company, Inc. Columbus, Indiana

Building a "perfect 36" from Joliet to Chicago

60-mile line of The Peoples Gas Light and Coke Company and Chicago District Pipeline Company spans congested area —under rivers, streets and railroads with minimum disturbance and maximum protection to populace

It was business as usual during construction of the third Calumet Line — a 36-inch pipe that will ultimately deliver 557 million cubic feet of natural gas per day to the Chicago area. Although the line crossed 77 roadways, 25 railroads and six principal streams, careful planning kept road, rail, barge and ship traffic flowing smoothly.

A. O. Smith supplied 20,000 tons of the largest standardized steel pipe available. The choice was natural. For over 30 years . . . A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe is found in so many important pipeline projects.

Through research ... *a better way*

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CORPORATION
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ROADS — Pipe tunneled under 77 roadways. Special steel plates were used to cover trench to keep streets, driveways and parkways open. In residential areas, special rubber-tired equipment kept down noise . . . mechanical sweepers kept down dust.

RAILWAYS — Line crossed 73 tracks of 17 railroad companies. Here workmen are installing steel casing for the line under the Atchison, Topeka & Santa Fe and The Gulf Mobile & Ohio tracks south of Joliet.

STREAMS — Line dives under the Calumet River on Chicago's south side. Tunnel is 687 feet long. Top of the tunnel is 60 feet below the surface. One of six river crossings constructed on the third Calumet Line.

Ten 20-ft. lengths of rigid pipe after being coupled. Two workmen did this job in only 20 minutes!

Workmen joining two sections of 1¼" rigid pipe.

ARIZONA PUBLIC SERVICE COMPANY SAVES 50% WITH

RIGID PIPE

made of ABS Plastic

RIGID PIPE GAS SYSTEM INSTALLATION OFFERS NEW PROOF OF SUPERIORITY OVER CONVENTIONAL TYPE

Big news for happy housewives in Gila Bend, Arizona—the convenience of gas utility service for the first time! Important news for utility companies everywhere—the 50% savings over cost of conventional pipe gained by use of Anesite rigid ABS pipe made of CYCOLAC throughout the system! Saved precious man-hours, too! Arizona Public Service Company completed the job in record time . . . insured a failure-free system with this lightweight, leak-proof, AGA-approved pipe. Another example of better service . . . bigger savings from rigid plastic pipe in vital municipal installations!

BE *ABSolutely* SURE . . .
INSIST ON RIGID ABS PIPE
made of
CYCOLAC®
THE BORG-WARNER PLASTIC THAT IS TOUGH, HARD AND CORROSION-RESISTANT

Write for the name of your nearest supplier

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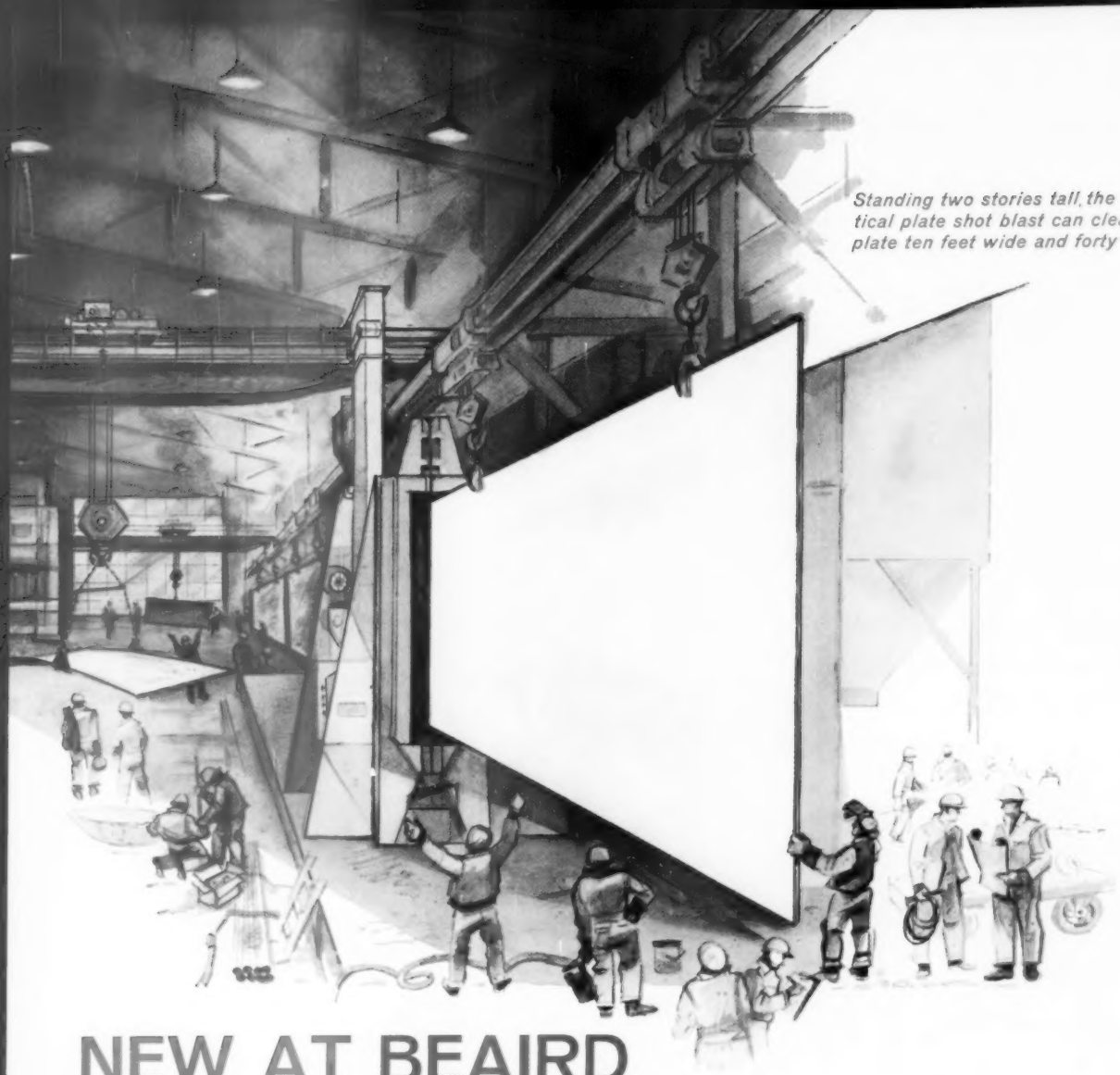


Standing two stories tall, the vertical plate shot blast can clean plate ten feet wide and forty feet long

NEW AT BEAIRD

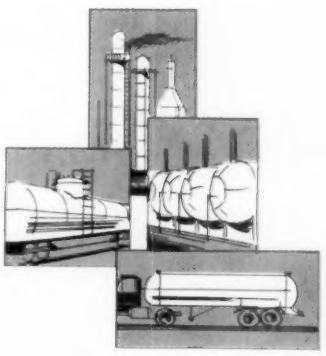
Assembly Line Vertical Plate Shot Blasting

Plate used in fabrication at Beaird is shot blasted cleaner than the proverbial whistle. Mill scale and foreign material are scoured off to provide a longer lasting paint bond, improve weld quality and free tank interiors from loose particles that may clog lines or contaminate product. Yet assembly line planning at Beaird has made this new service available without added cost to customers.

The vertical plate shot blasting system is just one of the many important equipment additions that are part of Beaird's planned facilities growth. Other new items include a 600-ton Gap Frame Press, 20-foot Plate Bending Rolls, Large Boom Welders, a 100-ton Bridge Type Crane and Precision Flame Planner for plate edge preparation.

Beaird is daily adding to its list of manufacturing accomplishments with such products as aluminum and alloy rail tank cars, stainless steel fractionating towers, giant pulp wood digesters and other specialized pressure vessels.

Check with Beaird on your next heavy steel or alloy product . . . you may save both time and money.



THE J. B. BEAIRD COMPANY, INC.
A subsidiary of American Machine & Foundry Company
Shreveport, Louisiana

SALES OFFICES: Shreveport, New Orleans, Louisiana • New York, New York • Tulsa, Oklahoma • Houston and Midland, Texas
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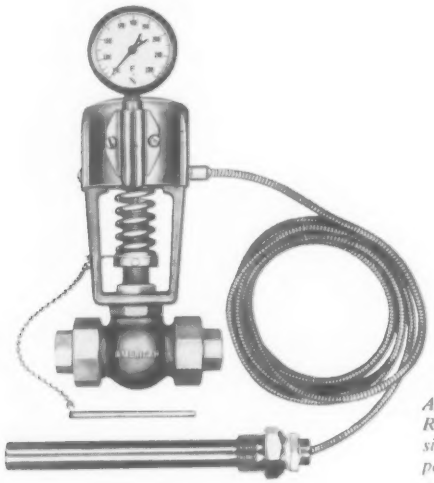
another AMF BEAIRD product

immediate

AMERICAN TEMPERATURE REGULATORS begin
corrective action with less than 1/10 degree change at the bulb



American Temperature Regulators are made in sizes ½" to 4". Temperature ranges as low as minus 15° F. to 50° F.—as high as 240° F. to 350° F.

response

You get fastest possible temperature response from these new regulators because the stem cannot bind and retard valve action.

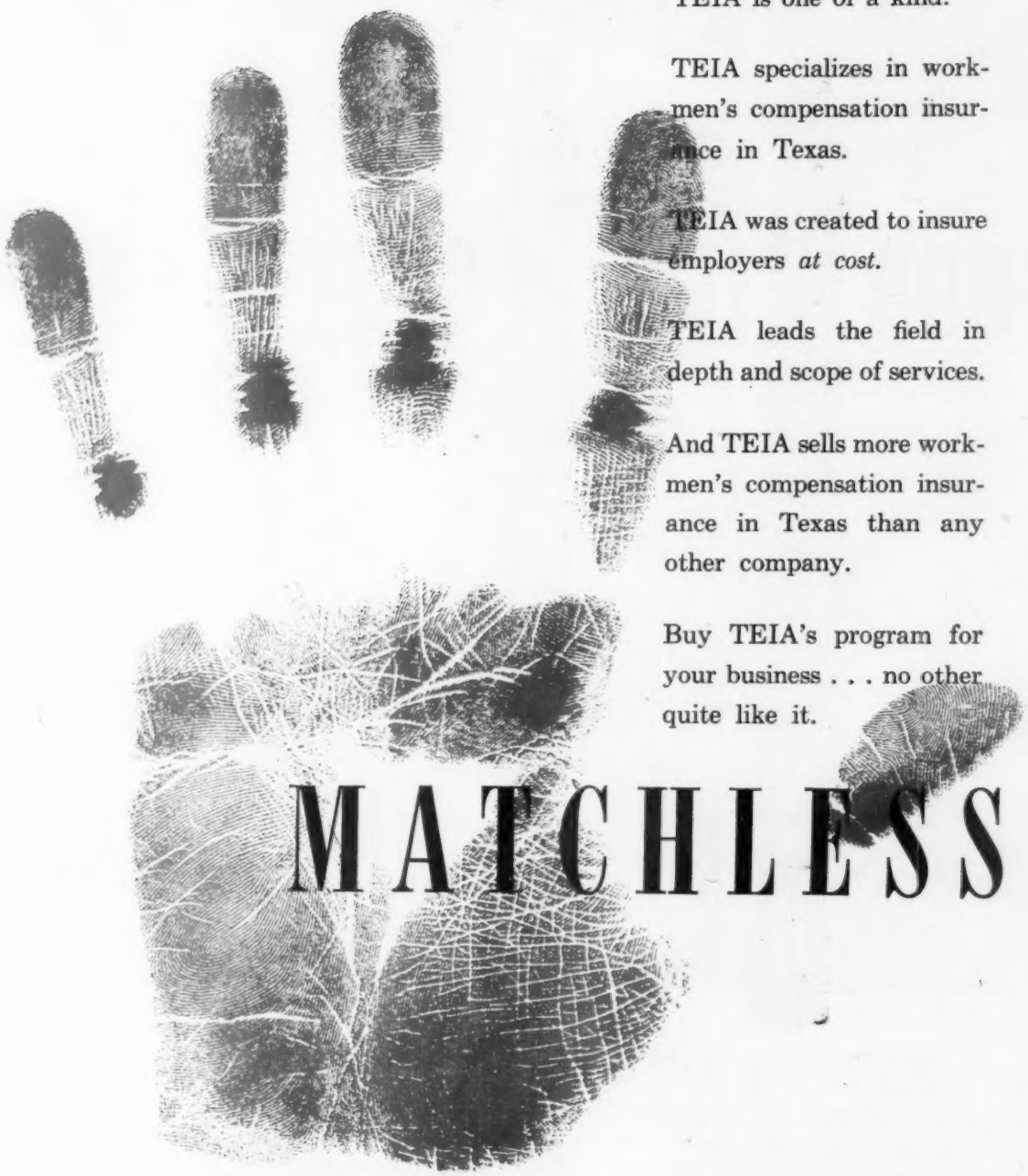
The valve stem on American Temperature Regulators is sealed off by a friction-free bellows that makes practical a nonleaking packless valve. Also contributing to fast, stable action is the use of an extra-long preflexed adjusting spring. This spring permits a long range of temperature adjustment without disturbing valve sensitivity at normal levels.

There are other high-quality features in American Temperature Regulators: maximum use of stainless steel; standardized parts; the fewest possible components; and unitized assembly. In addition, compactness simplifies installation in "tight" locations.

Accurate temperature regulation and attention-free operation mean long-term economy. Your industrial supply distributor will gladly help you select the right American Temperature Regulators for your needs. Write for Bulletin 114A.

MANNING MAXWELL & MOORE INC. M&M TRADE MARK

AMERICAN TEMPERATURE REGULATORS
A product of
MANNING, MAXWELL & MOORE, INC.
Consolidated Ashcroft Hancock Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario



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TEIA specializes in workmen's compensation insurance in Texas.

TEIA was created to insure employers *at cost.*

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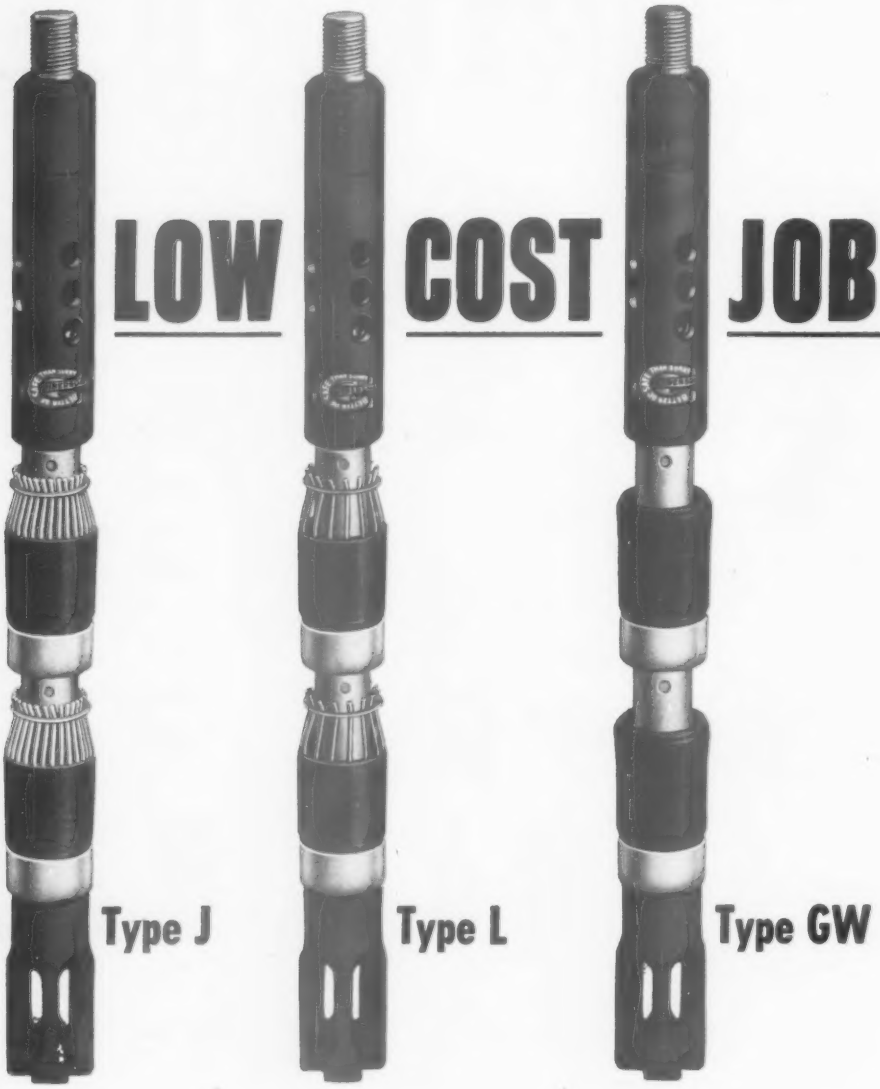
GUIBERSON SWABS DO A

GOOD LOW COST JOB!



GUIBERSON'S **Type J** **Type L** **Type GW**

Here are three swabs capable of swabbing all sizes of tubing and drill pipe — in a minimum of time — making them most economical and efficient for routine swabbing. Many other types of Guiberson cups are immediately available for *specific* and *unusual* swabbing problems.

CAN'T BE BETTER THAN SORRY GUIBERSON

THE

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ESTABLISHED 1919
DALLAS, TEXAS
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Sold by
Oil Field Supply Stores
Everywhere

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The golden rule that produces results...

Our golden rule is teamwork between refiners and Cyanamid. As a result of this teamwork, Cyanamid produced the first fully regenerative platinum reforming catalyst. Today Cyanamid's research efforts are directed toward the development of superior platinum reforming catalysts which will have general application in many reforming processes for the industry. Continued co-operation between refiners and Cyanamid contributes to the advances in petroleum processing technology.

Symbolizing this co-operation is Cyanamid's salesman—the man with the golden rule. You can depend on him at all times for help in meeting the operating problems caused by demands for ever-improved fuels. His personal knowledge is backed by the research and production facilities of one of the world's leading producers of catalysts. Call him anytime he can be of help to you...

Basic in catalyst chemistry

CYANAMID

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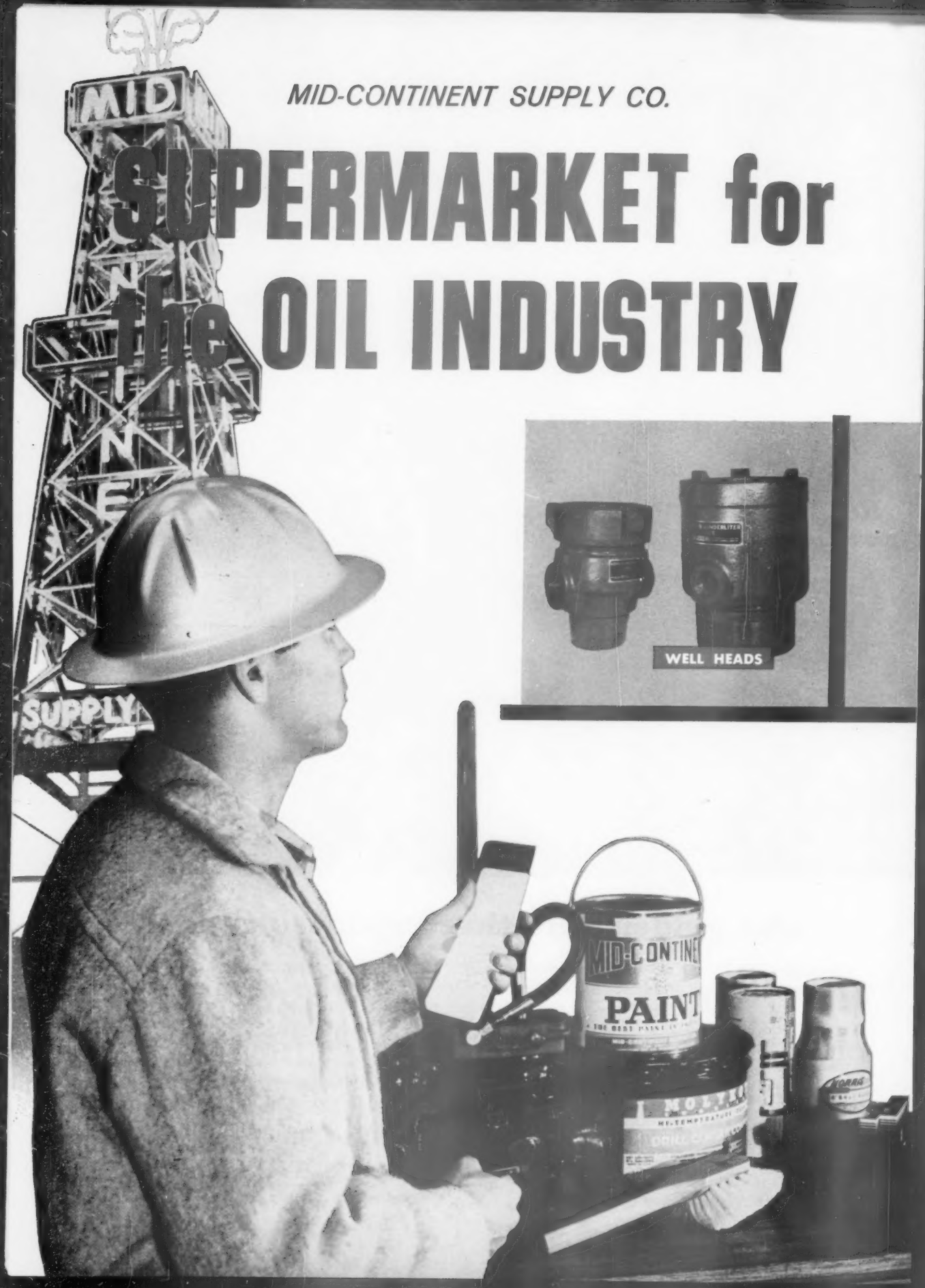
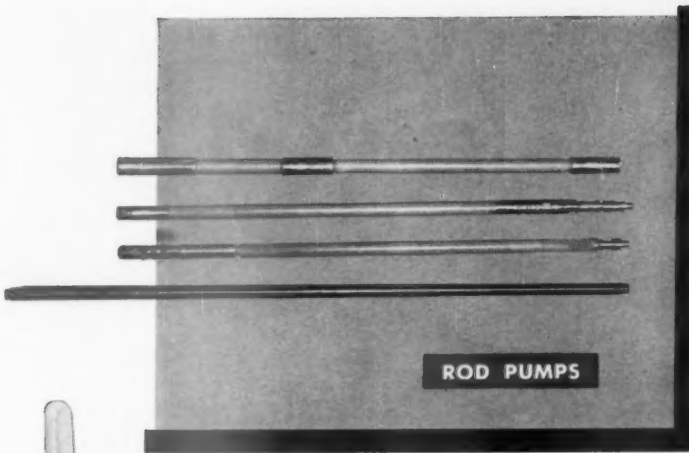
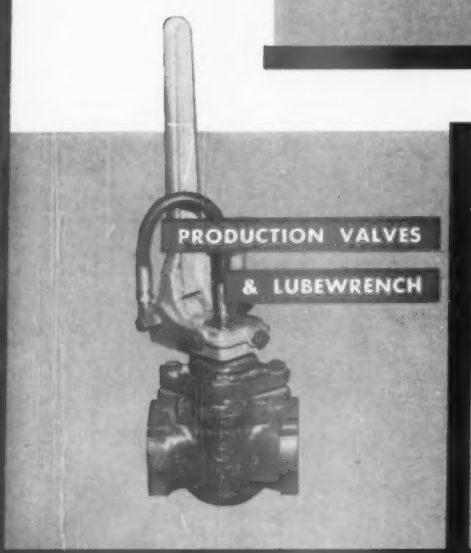
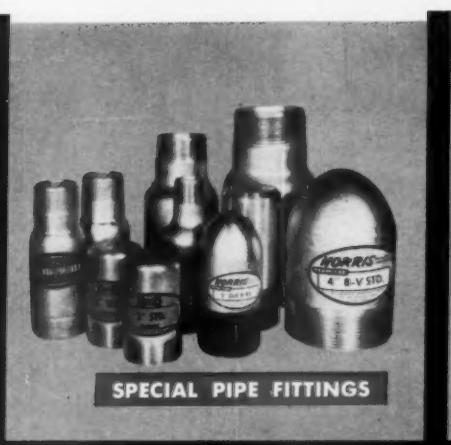
MID-CONTINENT SUPPLY CO.

SUPERMARKET for the OIL INDUSTRY

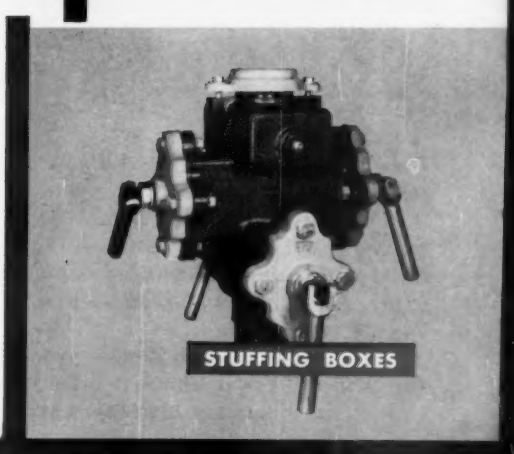








Supermarkets in the oil industry? It's one way of saying that Mid-Continent Supply Co., a vast network of field stores in the United States, Canada and South America, has everything. Mid-Continent field stores are stocked with thousands of different items needed daily in the oil fields—items of supplies and equipment with names well known and trusted for dependability and performance. Twenty-four hours a day, our "supermarkets" for the oil industry have skilled men to render top notch service and offer technical assistance. Let the neon derrick atop every Mid-Continent field store become your symbol of sure service . . . sure supply . . . around the clock . . . around the world.



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THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

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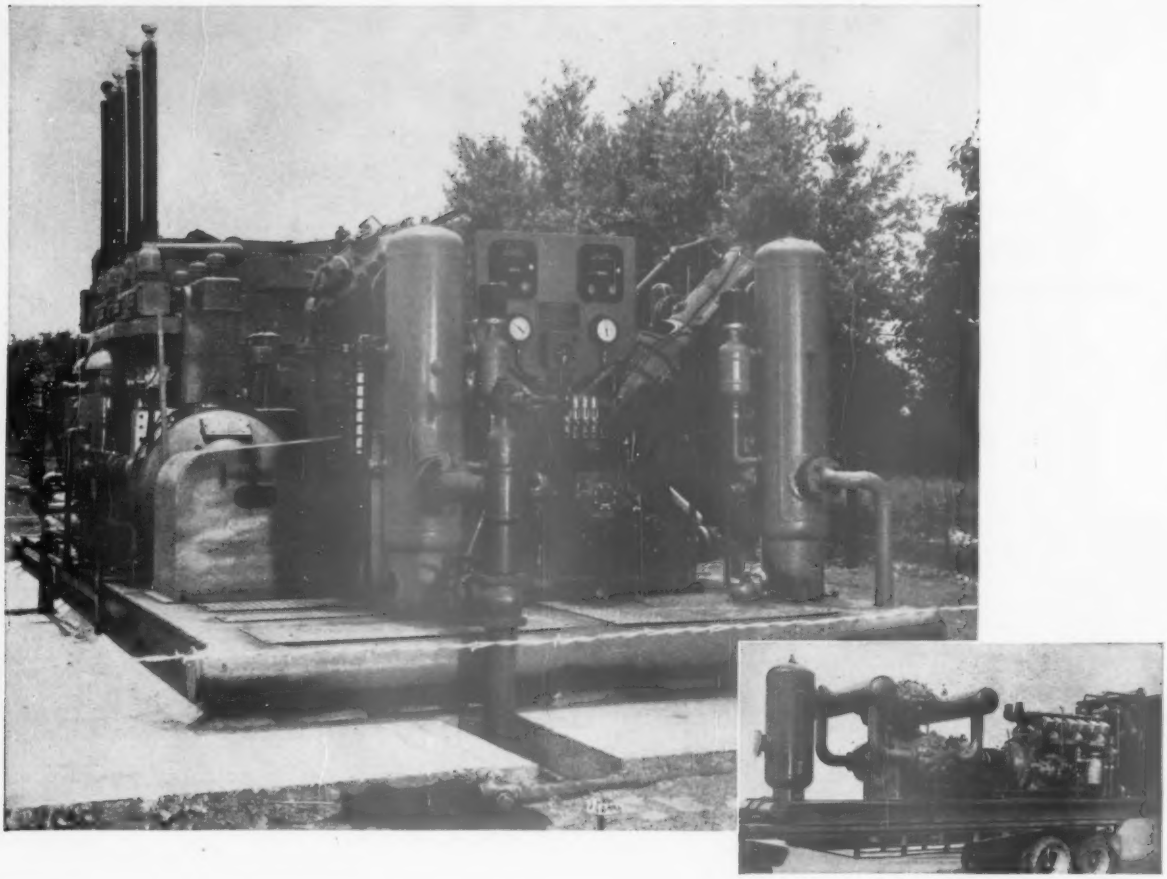

INTERCHANGEABLE CYLINDERS MAKE JOY GAS COMPRESSORS COMPLETELY FLEXIBLE

For unknown conditions in the well, or for rapidly changing conditions, only Joy gas gathering compressors give you the flexibility you need.

If operating conditions change, you can vary the compressor capacity by changing the cylinder liners. For extreme changes in operation, you can change the complete cylinder assembly, because *any Joy cylinder fits any Joy frame.* All cylinders accommodate a 7″ piston stroke, and all Joy compressors operate at 600 rpm.

This modern uniform design gives you a gas booster that fits any condition, any service . . . even moves to other locations. The entire unit is designed within normal size limits for highway transportation. For the flexibility you need in gas boosters, see your nearest Joy distributor-fabricator listed here, or write for bulletin 1211-31.

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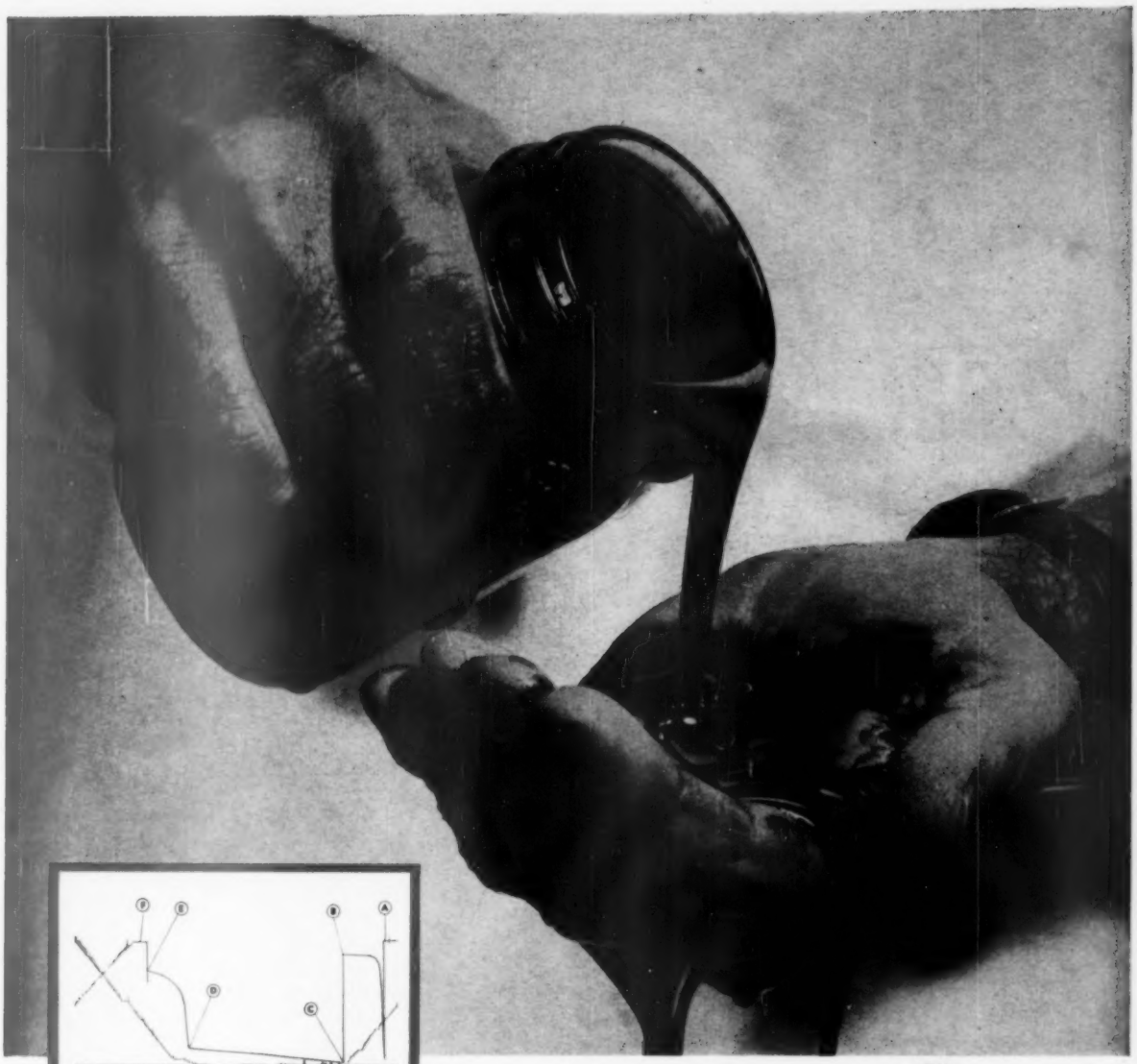
Tulsa, Oklahoma: Cherokee Steel Inc. • 160 N. Rockford
Pittsburgh 34, Pa.: P. C. McKenzie & Company • 3829 Willow Ave.



The Biggest Bargain In The Oil Patch!

For a fraction of the cost of a casing string, you get an actual sample of formation fluid and a complete pressure record. With these, fact is positively separated from fiction. Doesn't it make good sense to know if your well will produce before setting casing?

Don't chance setting casing in a dry hole—don't chance abandoning what might be a prolific producer—DRILL STEM TEST to be positively certain.

Next time, and always, call Johnston. You get more from a Johnston Drill Stem test—more experience, the newest and most sensitive recording equipment, accurate evaluation and a complete test record. No other service costs so little for so much.

The improved Hydraulic Tester. Write for complete information.

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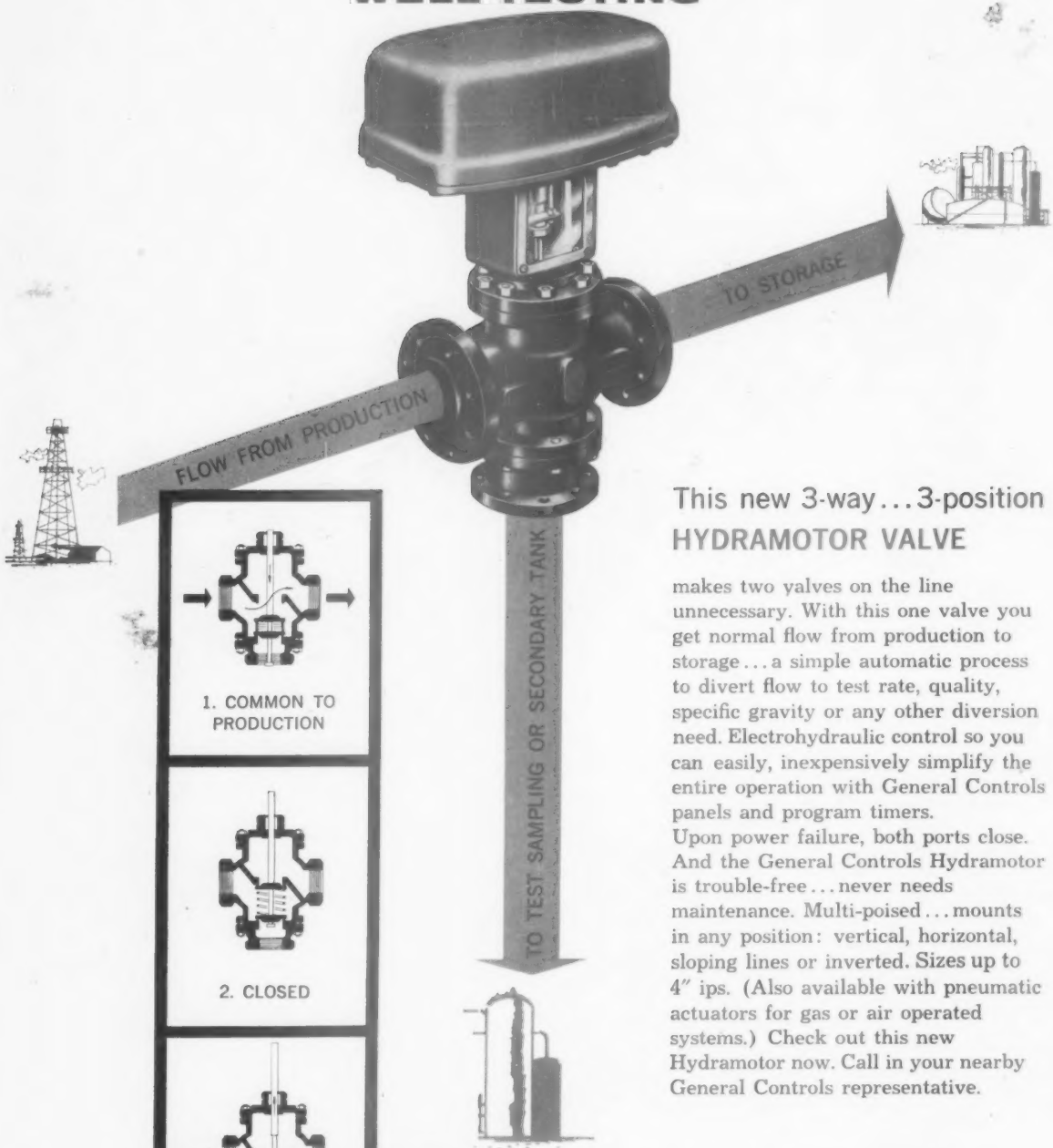
ONLY ONE ELECTRIC VALVE
NEEDED FOR AUTOMATIC WELL TESTING



This new 3-way...3-position
HYDRAMOTOR VALVE

makes two valves on the line unnecessary. With this one valve you get normal flow from production to storage... a simple automatic process to divert flow to test rate, quality, specific gravity or any other diversion need. Electrohydraulic control so you can easily, inexpensively simplify the entire operation with General Controls panels and program timers.

Upon power failure, both ports close. And the General Controls Hydramotor is trouble-free... never needs maintenance. Multi-poised... mounts in any position: vertical, horizontal, sloping lines or inverted. Sizes up to 4" ips. (Also available with pneumatic actuators for gas or air operated systems.) Check out this new Hydramotor now. Call in your nearby General Controls representative.

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Automatic Controls for Product or Process

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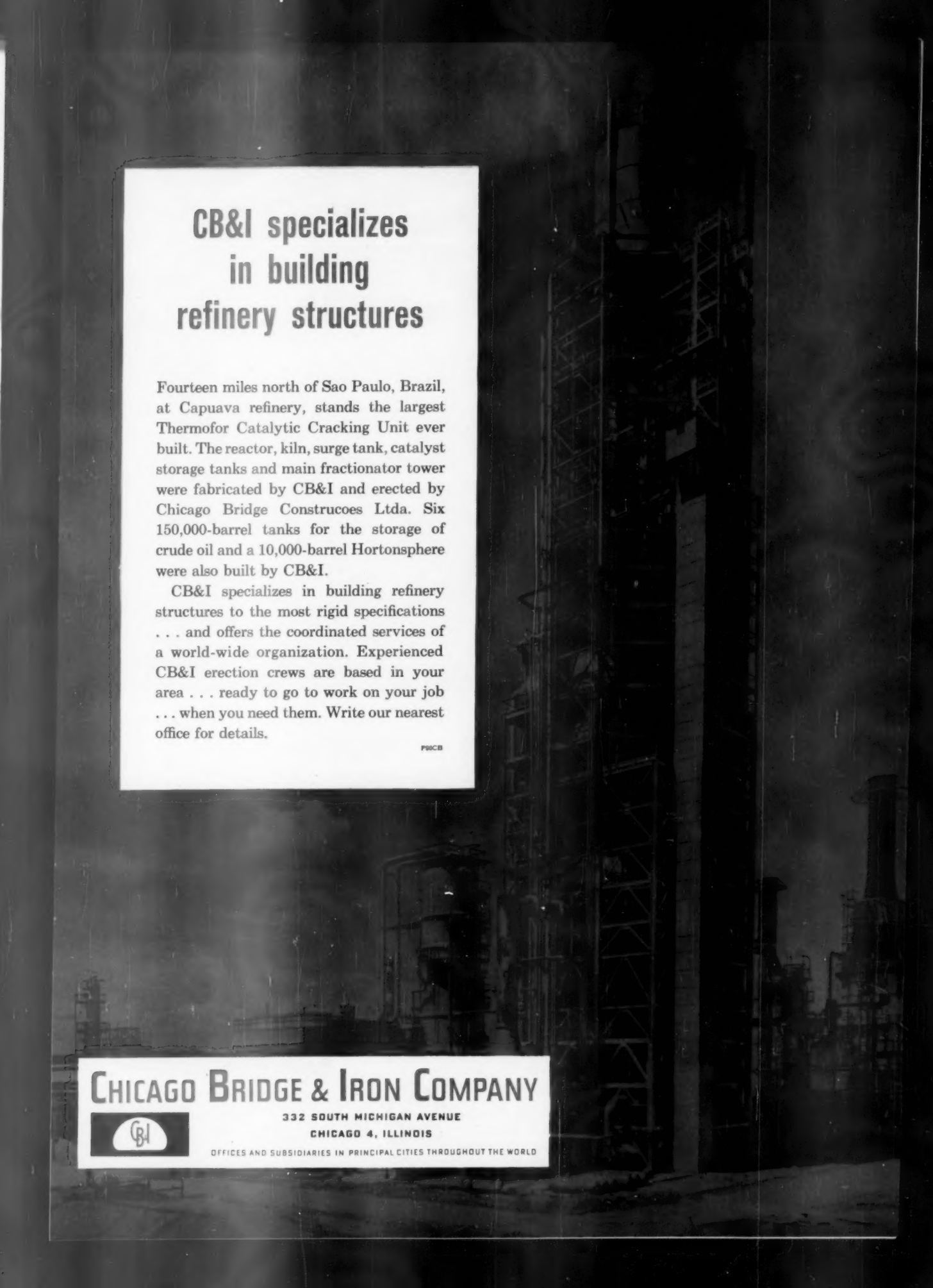
Nine plants—44 factory branch offices serving the United States, Canada and Western Europe



CB&I specializes in building refinery structures

Fourteen miles north of Sao Paulo, Brazil, at Capuava refinery, stands the largest Thermofor Catalytic Cracking Unit ever built. The reactor, kiln, surge tank, catalyst storage tanks and main fractionator tower were fabricated by CB&I and erected by Chicago Bridge Construcoes Ltda. Six 150,000-barrel tanks for the storage of crude oil and a 10,000-barrel Hortonsphere were also built by CB&I.

CB&I specializes in building refinery structures to the most rigid specifications . . . and offers the coordinated services of a world-wide organization. Experienced CB&I erection crews are based in your area . . . ready to go to work on your job . . . when you need them. Write our nearest office for details.

P86CB

CHICAGO BRIDGE & IRON COMPANY

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CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

there's more to Cities Service than meets the eye!

Designers and engineers work years ahead of actual production. Designers work directly with decorators and metal craftsmen to select new materials which can aid them in working out advanced designs.

More than seven million new cars will roll off the production lines this year. Behind them is a complex network of designers, researchers, test drivers, and testing laboratories. Most of us fail to realize the enormous combination of people and tasks it takes to produce the "pride of the family."

Likewise, motorists pulling into a Cities Service station in their new, high-powered cars don't realize the vast number of people and jobs it takes to produce gasolene. For instance, Cities Service has a full staff of research and technical experts, searches four continents for oil, maintains giant refineries, research labs, uses a pipe-line system that can circle the globe and a fleet of super tankers, too!

And Cities Service has spent over a billion dollars in product development.

Only in this way can America have what it needs for progress—more jobs and more and better oil products.

Every joint you put in the ground . . . puts twenty-three dollars in your pocket

Tex-Tube Lightwall Pipe saves you money in pipeline construction. Because it is made from high-strength steel, its lighter wall does the work of a standard wall. In a 1000-lb. gas line, for example, Tex-Tube 6⅝″ x .156″ wall TX-52 costs you $56 per joint as compared to $79 per joint of standard weight .280″ wall. This is a savings of $23 per 45-ft. joint, or $2680 per mile.

So much for initial savings. In addition, Tex-Tube Lightwall is easier handling, faster laying. The larger inside diameter is still another bonus.

For the full story, call the man from Tex-Tube in your area, or write us.

PIPE MANUFACTURERS
High Tensile Lightwall Pipe
Oil Well Casing
Oil Well Tubing
Structural and Mechanical Tubing
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Upsetting, Threading, Normalizing

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among the many components offered are: Condensers, Ejectors, Heat Exchangers — Bare Tube, Extended Surface Heat Exchangers,

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lines offers important savings for management and engineering staffs engaged a variety of applications in power plants, marine, process and nuclear systems.

C. H. Wheeler Manufacturing Company, with 71 years' experience manufacturing condensers, ejectors, pumps and other components for the power, marine, process and nuclear industries, and Griscom-Russell, with 92 years' experience in the heat exchange field, are uniting to create an important pool of experience, products and services unmatched in industry today. The advantages offered by this combination are improved and increased selection, distribution and service, resulting in substantial savings for the current and potential customers of both companies.

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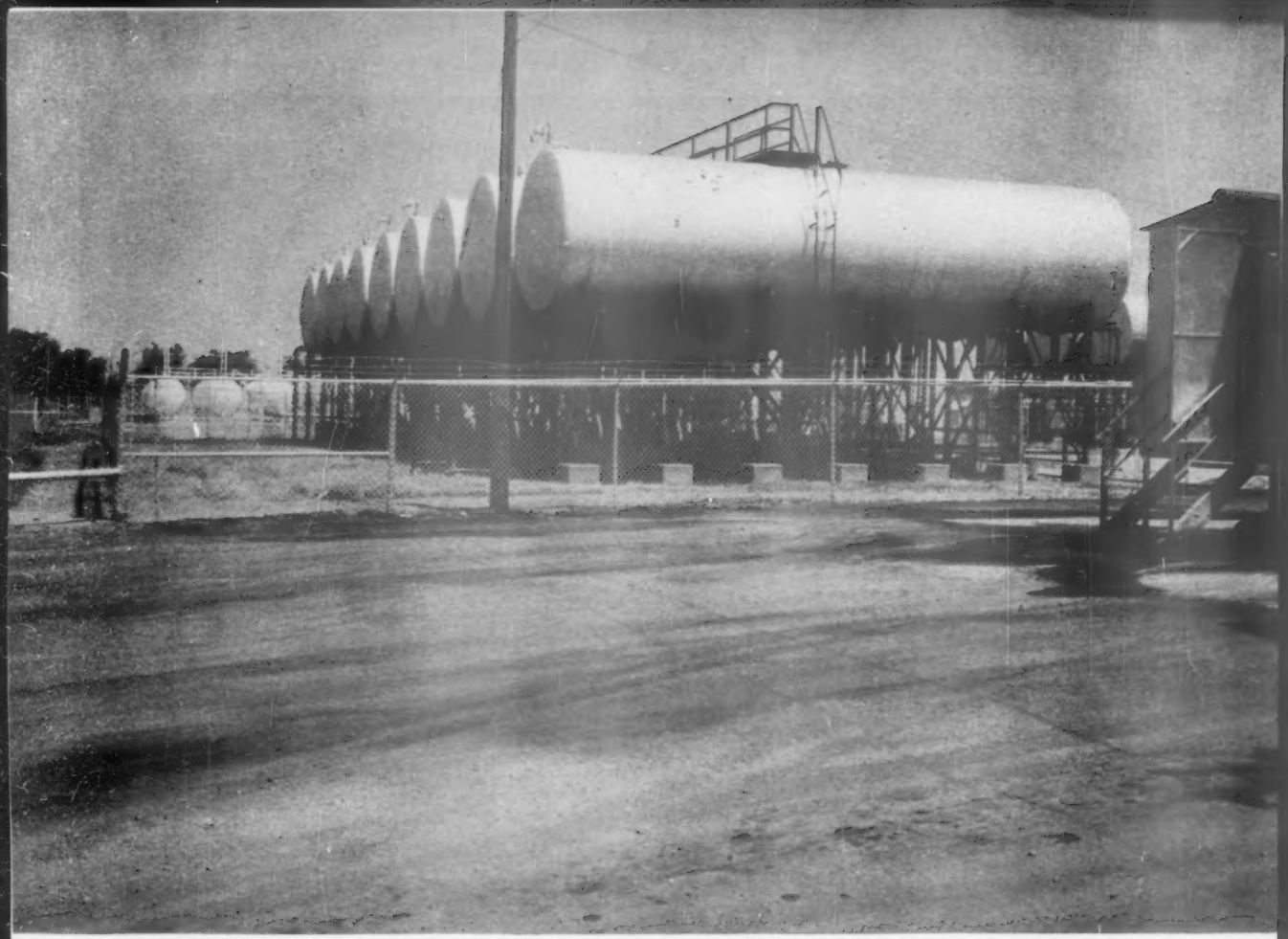
Evaporators, Marine Distilling Plants, Marine Systems, Pumps, Nuclear Components, Valve Actuators, Custom Fabrication and Machining



• The Skelly Oil Company kept the area around these butane-propane storage tanks completely free of weeds for a whole season by spraying the ground with Du Pont "Telvar".

Get season-long control of fire-hazardous weeds —spray once with a Du Pont Weed Killer

No fire hazard here from weeds. No expensive or difficult weed-control program, either. Just a simple weed-control maintenance program with a Du Pont weed killer kept the area around these storage tanks clean. One spraying of Du Pont "Telvar" monuron or "Karmex" diuron weed killers provides safe, economical weed control around refineries, storage tanks, pipelines and producing fields for a season or longer. Fire hazards are eliminated.

Five-year records of several petroleum companies show that Du Pont "Telvar" and "Karmex" cut weed-control budgets from 50 to 75%. "Telvar" and "Karmex" are non-flammable, non-volatile, non-corrosive and low in toxicity to man and animals. Contact Du Pont for information on which weed killer is best suited to your soil type and moisture conditions—write Du Pont, 2543 Nemours Bldg., Wilmington 98, Delaware; in Canada: Du Pont of Canada Ltd., P. O. Box 660, Montreal, Quebec.

On all chemicals, always follow label instructions and warnings carefully.

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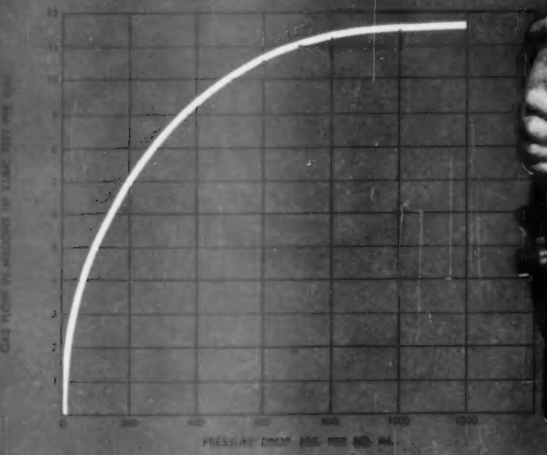
Weed and Brush Killers

TELVAR® monuron weed killer · **KARMEX®** diuron weed killer · **AMMATE® X** weed and brush killer · **TRYSBEN® 200** weed killer · **DYBAR®** fenuron weed and brush killer

Flow area thru UNIBOLT ADJUSTABLE WING VALVE
Passes Large Quantities of Fluid or Gas

FLOW OF WATER THROUGH UNIBOLT CHOKE
WITH 1" SEAT



FLOW OF GAS THROUGH UNIBOLT CHOKE
WITH ½" SEAT AT 2000 PSI INLET PRESSURE

if you could produce 10,000 bbls. per well per day . . .

. . . as the charts show, this UNIBOLT Adjustable Wing Valve would handle the fluid with only a 100-lb. pressure drop! Or, you could produce 28 million cubic feet of gas through it with only a 200-lb. pressure drop. So, while the UNIBOLT Adjustable Wing Valve is not a full-opening type, its one-inch flow area is far more than adequate for practically any desired production rate—*and the cost is importantly lower than for conventional gate and plug valves.*

Actually, there's a dozen more good reasons why this UNIBOLT Adjustable Wing Valve is a solid favorite among value-conscious operators:

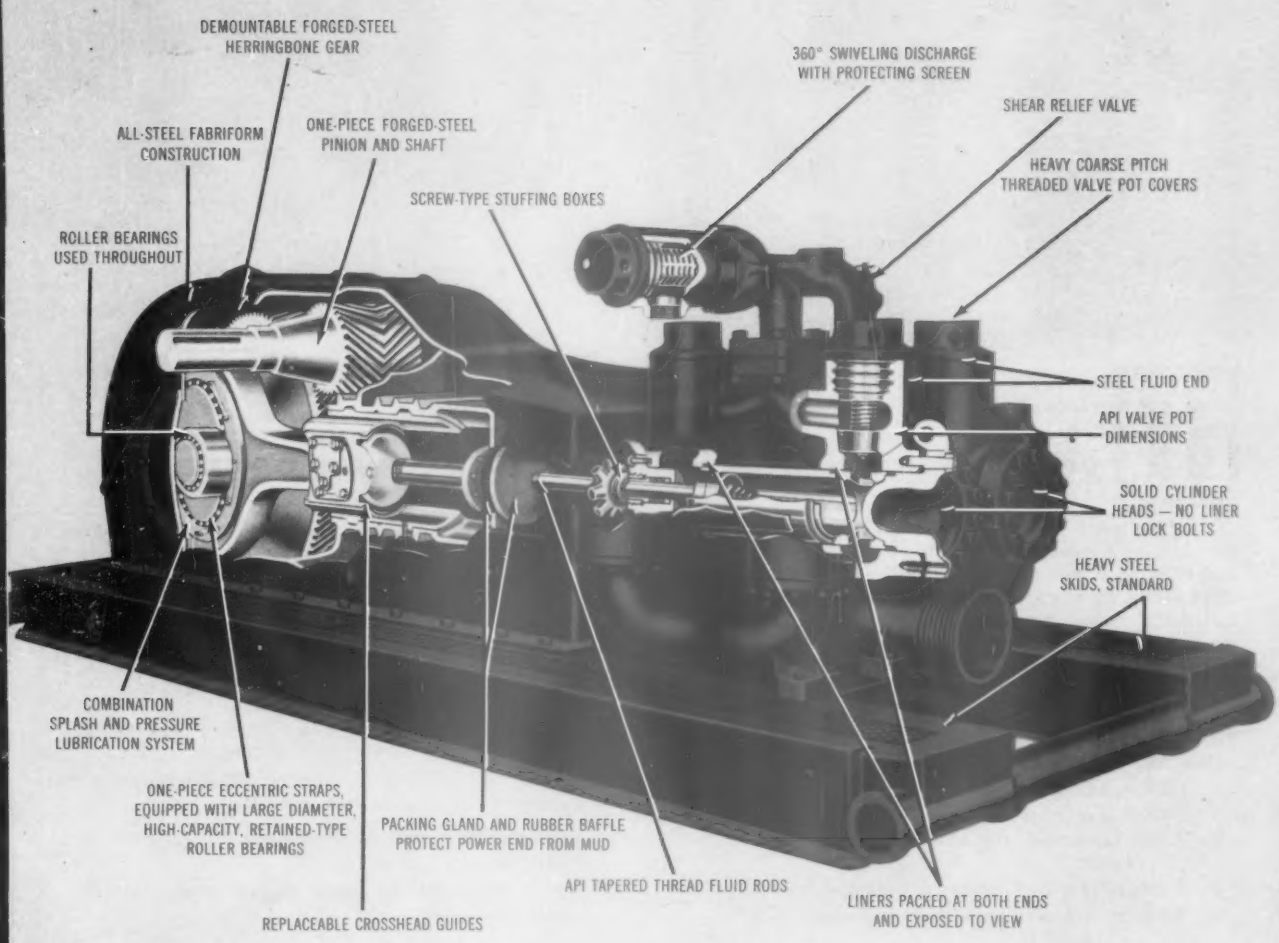
1. There are no exposed threads . . . no accidental damage.
2. All metal seats . . . not affected by high or low temperature.
3. Stem packing that needs no tightening.
4. Stem turns freely under high pressures.
5. Threads on stem not exposed to external or internal damage.
6. Full 2½" pilot for true stem alignment and rigidity.
7. Streamlined flow—no obstruction, no turbulence or impingement of flow, no negative pressure areas.
8. Requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
9. Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
10. Can be converted to "Pressurematic Safety Valve" by simply changing bonnet assemblies.
11. Valve can be completely overhauled without removal from tree.
12. Stem seat sealed by metal gasket; power threads assure alignment.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

NOW 7 CONTINENTAL-EMSCO SLUSH PUMP SIZES

..a complete line able to provide all the mud pressures and volumes needed for today's drilling rigs

Feature by Feature..you can't beat these Pumps


DEMOUNTABLE FORGED-STEEL HERRINGBONE GEAR
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ROLLER BEARINGS USED THROUGHOUT
STEEL FLUID END
API VALVE POT DIMENSIONS
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COMBINATION SPLASH AND PRESSURE LUBRICATION SYSTEM
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PACKING GLAND AND RUBBER BAFFLE PROTECT POWER END FROM MUD
API TAPERED THREAD FLUID RODS
LINERS PACKED AT BOTH ENDS AND EXPOSED TO VIEW
REPLACEABLE CROSSHEAD GUIDES

POWER END DESIGN

In place of bulky steel castings, a smooth, easy to handle steel fabriform frame is used. Fabriform construction allows critical stress areas to be reinforced scientifically, and it is as strong, yet lighter than castings. The massive main gear, of wear-resisting heat-treated forged steel, is designed to handle the highest of mud pressures. It is matched with a long-wearing, heat-treated forged-steel pinion, machined integrally with its shaft. Roller bearings, used throughout, reduce power loads and eliminate need for bearing adjustment. Crosshead guides (slippers in larger pumps) can be replaced for added years of pumping.

FLUID END DESIGN

Steel castings are electrically welded into compact fluid ends to handle the highest of mud pressures. Suction passages are large, direct and smoothly curved to speed fluid flow, even when pumping heavy muds. Use of one suction eliminates *dead spaces* which tend to restrict flow. A separate pot for each valve provides easy access to valve chambers. Screw-type valve-pot covers speed valve replacement. Patented "exposed" liner construction prevents costly washouts and damage to liner or fluid ends, because leaks can be spotted and packing tightened before damage occurs. Screw-type stuffing box glands apply an even pressure for packing and eliminate uneven packing wear and scoring of piston rods.

D-1000

Maximum Input
. . 1000 hp @ 60 rpm
Maximum Liner Size 8¼"
. . 933 gpm @ 1562 psi (60 rpm)
Minimum Liner Size 5½"
. . 419 gpm @ 3480 psi (60 rpm)

DA-850

Maximum Input
. . 850 hp @ 60 rpm
Maximum Liner Size 8¼"
. . 933 gpm @ 1328 psi (60 rpm)
Minimum Liner Size 5½"
. . 419 gpm @ 2954 psi (60 rpm)

DA-700

Maximum Input
. . 714 hp @ 65 rpm
Maximum Liner Size 8¼"
. . 852 gpm @ 1197 psi (65 rpm)
Minimum Liner Size 5½"
. . 374 gpm @ 2727 psi (65 rpm)

D-550

Maximum Input
. . 550 hp @ 65 rpm
Maximum Liner Size 7½"
. . 751 gpm @ 1067 psi (65 rpm)
Minimum Liner Size 4½"
. . 275 gpm @ 2915 psi (65 rpm)

D-375

Maximum Input
. . 375 hp @ 70 rpm
Maximum Liner Size 7½"
. . 723 gpm @ 744 psi (70 rpm)
Minimum Liner Size 4½"
. . 274 gpm @ 1991 psi (70 rpm)

D-225

Maximum Input
. . 225 hp @ 70 rpm
Maximum Liner Size 7½"
. . 580 gpm @ 565 psi (70 rpm)
Minimum Liner Size 4½"
. . 211 gpm @ 1551 psi (70 rpm)

D-125

Maximum Input
. . 125 hp @ 85 rpm
Maximum Liner Size 7¼"
. . 580 gpm @ 308 psi (85 rpm)
Minimum Liner Size 4½"
. . 216 gpm @ 840 psi (85 rpm)

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SP901

New Visco Well-Treating Formula Penetrates, Loosens, Disperses Deposits in Tanks, Lines, Tubing

Lowered pumping pressure, Tripled production, Dispersed solid paraffin... Among Spectacular Performance Results with Visco 1111

Visco 1111, on the job in oil and gas producing wells, water-injection wells and salt water disposal systems, has amazed even the most optimistic with its performance and economy. Here are a few examples of how it works to penetrate, loosen and disperse deposits of paraffinic-asphaltic compounds, carbonate scale, sodium salt deposits, iron compounds and other materials causing loss of production.

Cuts Pumping Pressure 175 psi

Injection pressure was 325 psi on a water injection well. Foreman believed pressure was due to a tight formation, but agreed to a test of Visco 1111. Pressure is down to 150 psi—and staying there, with one-gallon-per-day dosage of Visco 1111.

7-Well Cleanup Nets 60 bbl. Increase

Sticking pumps, caused by scale build-up, were causing frequent rod-pulling jobs on a 7-well East Texas lease. Visco 1111 cleaned up the pumps and tubing, upped production 60 bbl. per week. Company now using Visco 1111 on all their wells in East Texas.

Stopped Reperforating Need

On another East Texas lease, wells making high salt water with low-gravity oil tended to scale up and require periodic reperforation. Visco 1111 was given a trial on a well making only 3 bbl. oil and 20 bbl. water a day... quickly jumped daily production to 23 bbl. oil and 60 bbl. water. Cost: only $23.50 . . . as against $300 to reperforate.

Solid Foot of Paraffin Gone

A 500 bbl. tank contained 470 bbl. oil and a 12-inch paraffin bottom—so hard that an oil thief would not drop through. 5 gallons of Visco 1111 and 48 hours later the tank went on at 0.5% B.S. & W., *and no bottom at all.*

Easy to Use, Too!

Visco 1111 has excellent blending characteristics under a variety of field conditions, and does not gel when added to water. Your Visco Service Man will be glad to help you determine proper Visco 1111 dosages for best performance and economy on your leases. Ask him about this new well-treating product . . . or write us, today, for detailed product data.

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the instruments

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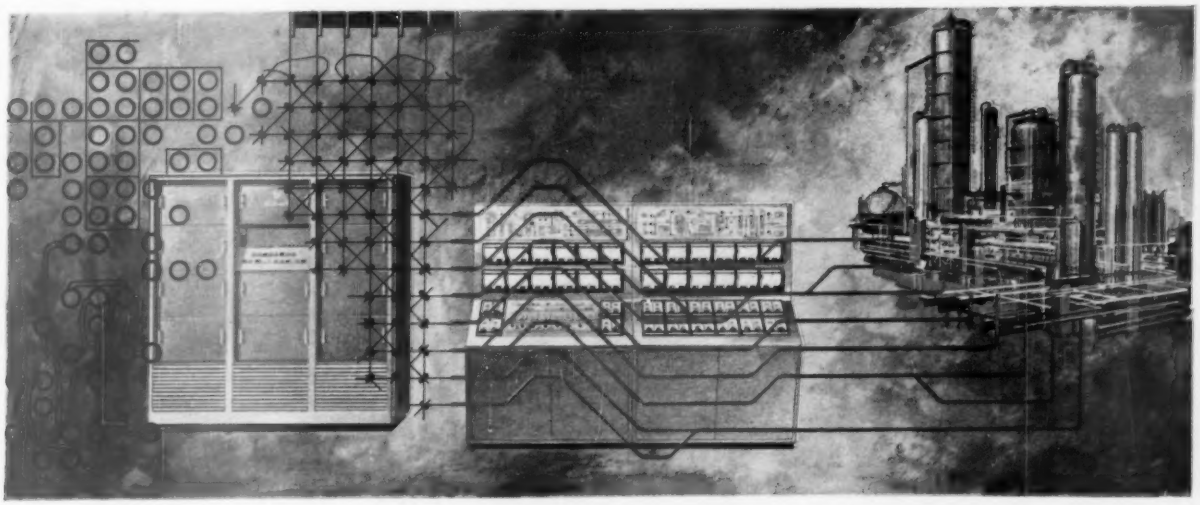

A dynamic new force in computing control is now available to the process industries. Foxboro, and the Radio Corporation of America, contributing their individual capabilities, bring industry its first completely integrated computing control system. From Foxboro, the instrumentation, the knowledge of process dynamics. From RCA, the digital computer, and its special electronic techniques. A breadth and depth of talent available with overall systems responsibility through The Foxboro Company. When you are investigating the feasibility of computing control, look into this new force. The Foxboro Company, 604 Neponset Avenue, Foxboro, Massachusetts, U. S. A.

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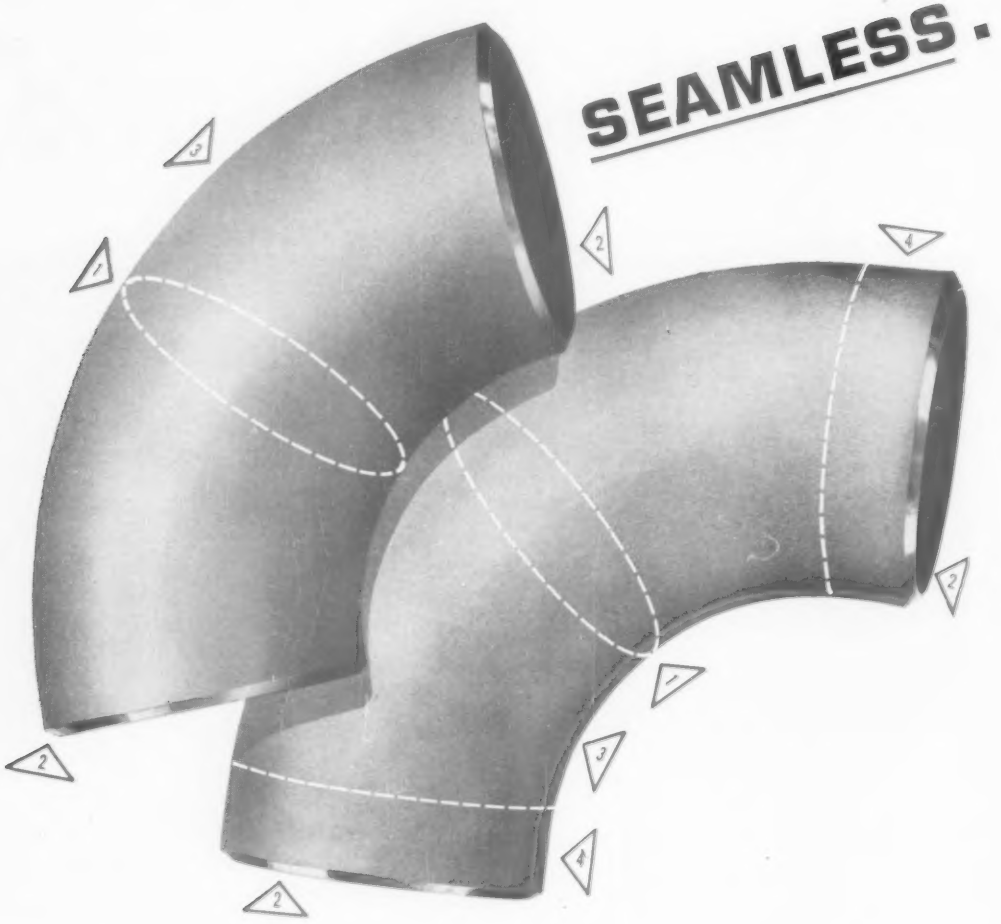
NOW...BOTH!



1. BONUS... All fittings hot-coined in compression throughout entire length—dimensionally true to permit segmenting at any point. **2.** BONUS ... Seamless and welded-type fittings with specially machined ends assure uniform thickness and diameters . . . ends that are circle-perfect, plumb and square. **3.** BONUS... Wall thickness and uniformity—greater than required by ASA Standards. **4.** BONUS... Long Tangent bonus on welded-type fittings—NO EXTRA COST—saves pipe, simplifies lining-up, eliminates short welded stubs.

..BY MIDWEST

NEW! The finest *seamless* welding fittings ever made. NOW—a hot-coined fitting, dimensionally accurate from end to end . . . fittings forged at controlled heat for superior metallurgical quality . . . with specially machined ends for quickest fit-up and welding! Produced by the newest and most modern equipment—combined with the latest technology in forging, sizing, heat-treating, and machining. Available in all sizes through 24″—long radius or short—90's, 45's, 180's.

WELDED . . . BY MIDWEST

Welded-type fittings, fully reinforced . . . especially "Long Tangent" bonus fittings . . . always available from stock in carbon steel through 36″ (to order through 48″)—same high quality as always. Also available from stock in wrought iron and chrome-moly. Fittings formed from plate and welded are ideally suited to unusual requirements—heavy wall (2″, 3″, 4″ or more) . . . Hi-Yield, Inconel, stainless, Hastelloy and all other weldable metals. Extra tangent lengths, reducing ells, and special fittings of all kinds are made best as welded-type fittings.

THE WORLD'S MOST COMPLETE LINE OF WELDING FITTINGS . . . sold through stocking distributors from coast to coast.

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FITTINGS, No. 60-C

PIPING COMPANY, INC.
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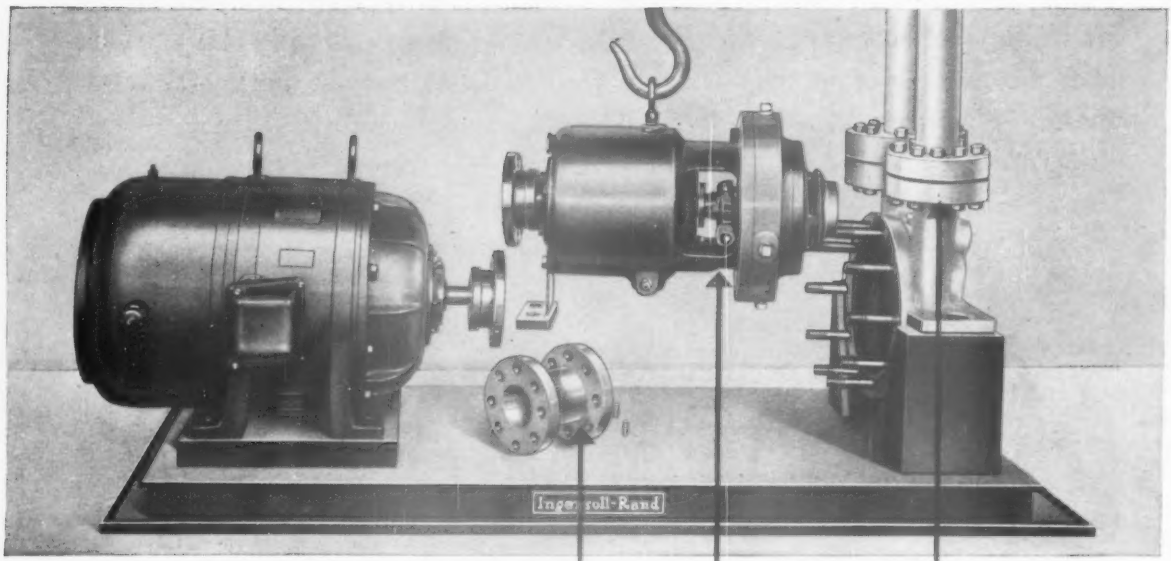
Why I-R process pumps are

SO EASY

to maintain



SIMPLY BY REMOVING THE SPACER COUPLING

THE ENTIRE PUMPING ASSEMBLY

CAN BE LIFTED OUT WITHOUT DISTURBING THE DRIVER OR PIPING

EASY ACCESS is just one of *many* features that make Ingersoll-Rand process pumps easier and more economical to inspect and maintain. Saving down-time by speeding disassembly and reassembly is a big asset. But even more important is the extra stamina and dependability that keeps these pumps *on the line* longer with no interruptions of service.

Maintenance-saving features include vibration-free balanced impellers, rugged casing with generous corrosion allowance, rigid precision ground heat-treated shafts, extra-deep stuffing boxes and completely removable split-type glands. For complete information, contact your nearest Ingersoll-Rand sales engineer.

A CENTURY 1860 – 1960 OF PUMP PROGRESS

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COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

CLEAN DRY SAFE

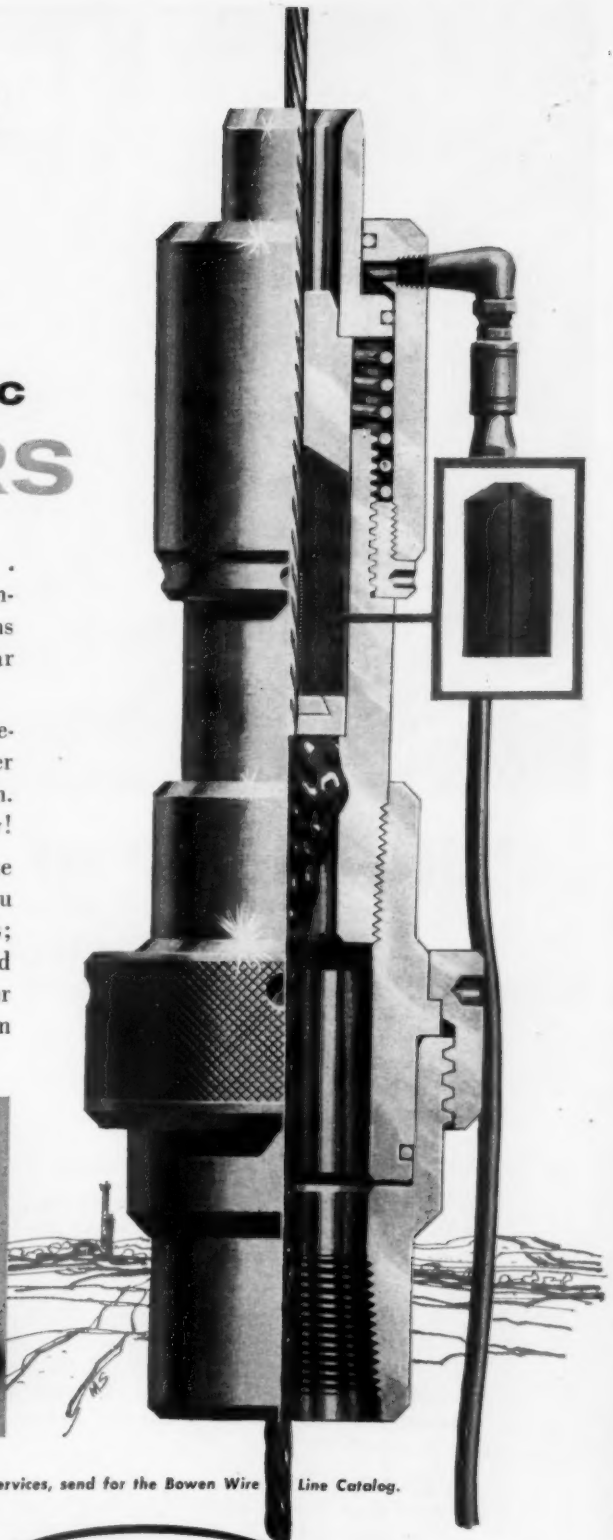
with Bowen Hydraulic LINE WIPERS

Operates hydraulically from safe distance . . . positive wiping action . . . sure pack-off performance . . . clean, safe location—all good reasons why Bowen Hydraulic Line Wipers are so popular for swabbing operations.

New line rubber, made of a special elastomer, reduces wear, cutting and chipping—provides higher strength to minimize abrasion and tearing action. And this new line rubber is priced amazingly low!

If you are presently using Bowen Single-Stage Line Wipers, a simple Conversion Assembly allows you to convert these to Bowen Hydraulic Line Wipers; another reason why Bowen products are in demand wherever wire line services are performed. Order your Bowen Hydraulic Line Wiper or Conversion Assembly now!

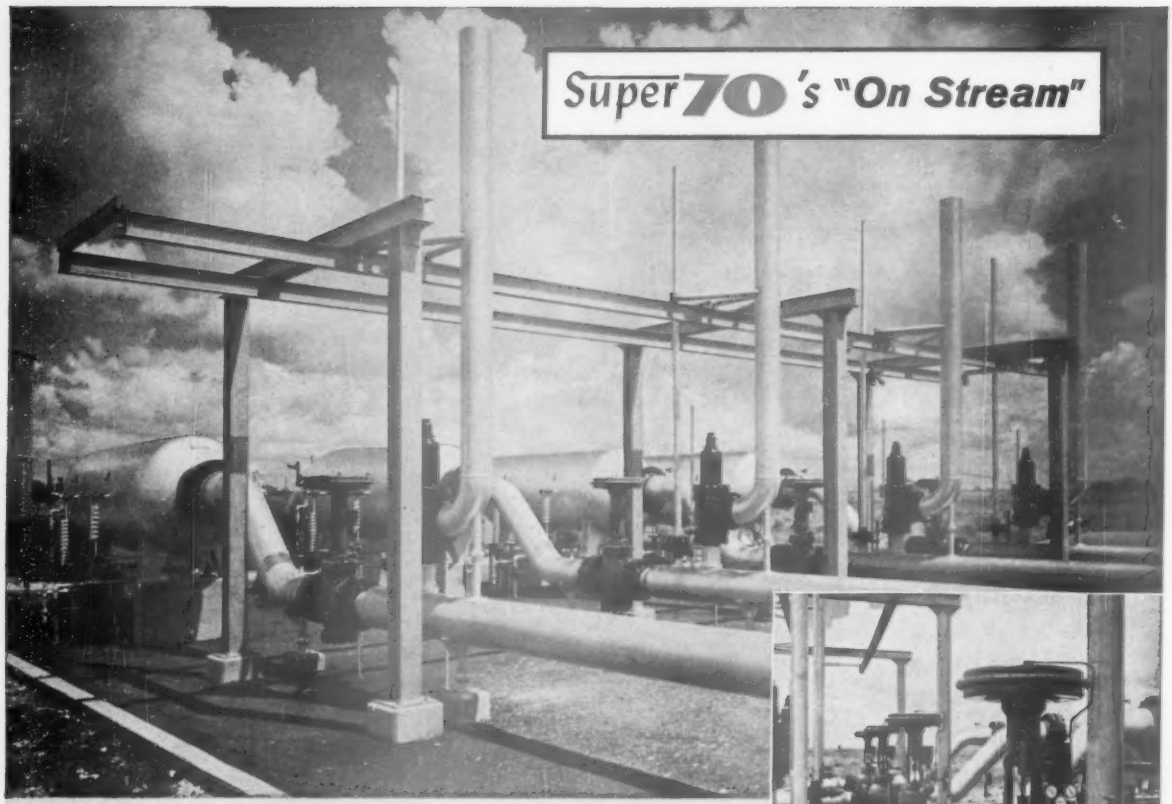
Assembly No. 14125 is easily converted to a Bowen Hydraulic Line Wiper!



To obtain information on Bowen Line Wipers for other wire line services, send for the Bowen Wire Line Catalog.

BOWEN ITCO, INC.
P. O. Box 4587 Houston 13, Texas

BOWEN 1935 25th ANNIVERSARY 1960



"Life-Blood" of a Large Refinery!

BS&B Super 70 Diaphragm Control Valves with Clamp Ring—Float Ring Body Closure.

This natural gas metering station feeds 100 MMSCF of gas per day to a large Gulf Coast Refinery. If it were necessary to shut down the station for repairs, operation of the refinery would be seriously impaired.

That's why engineers who designed the station wanted to be absolutely sure the control valves would function properly day in and day out under all operating conditions.

Because of their superior performance characteristics and rugged dependability . . . and because of BS&B's reputation for quality products and dependable service in the oil industry . . . BS&B Super 70 Control Valves were selected. Now "on stream", they are performing well in every respect.

BS&B Super 70 Valves are available in a complete range of sizes . . . with either clamp ring—float ring, or flanged—gasketed body closures. Specify them on your next job!

SUPER BS&B 70

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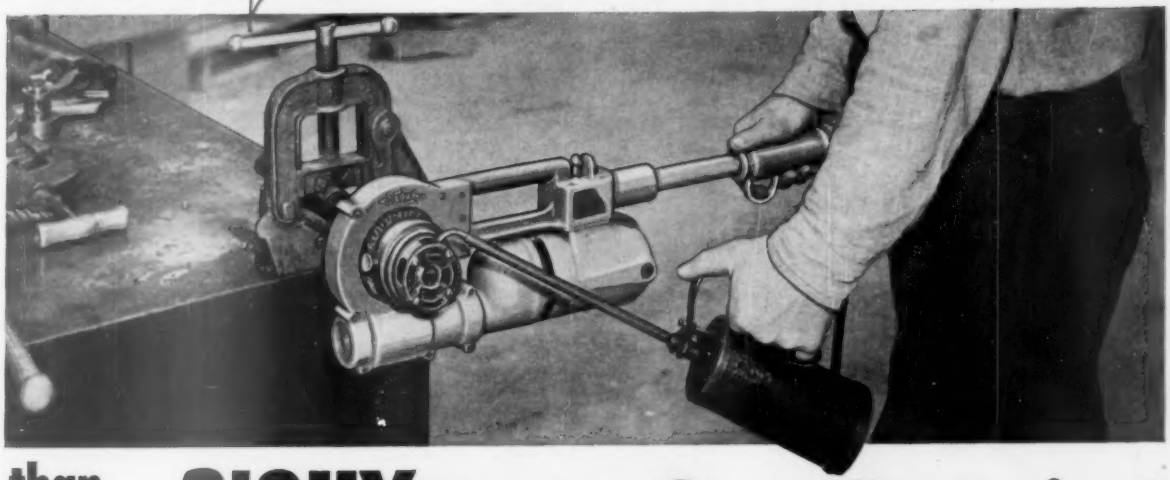
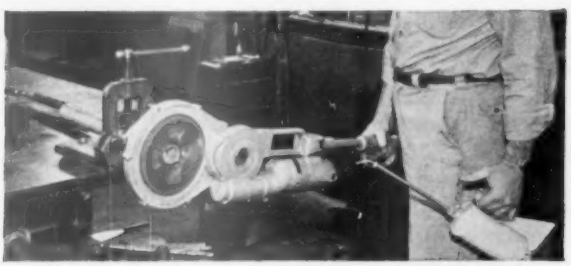
"Nothing Ever Saved More Time....."

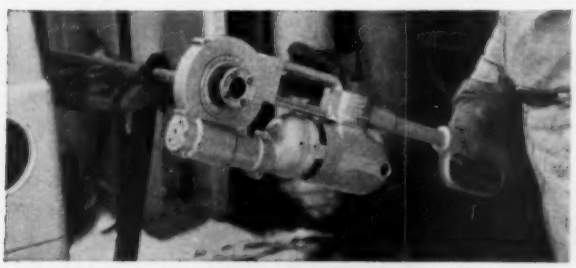


than the new SIOUX Power Pipe Threader!

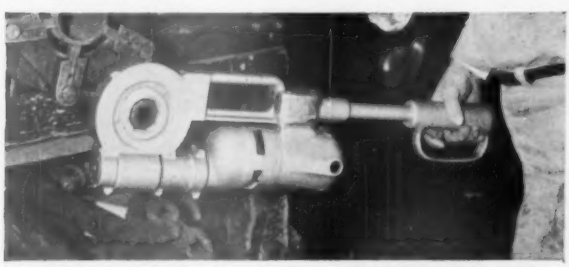
WITH THE SIOUX POWER PIPE THREADER you can thread ¼" to 1" pipe in 20 seconds; 1" and 2" pipe in one minute, 24 seconds! When labor costs 6½ cents per man per minute, a power tool like this for which there is a continuing need doesn't take long to pay for itself. The SIOUX Power Pipe Threader is said to be saving more time and money than any other major portable power tool!



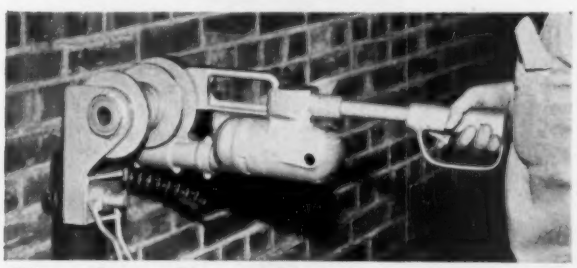
SIOUX NO. 1508 PIPE THREADER in use with No. 1511 Speed Reducer.



THREAD PIPE ON THE JOB, in a hurry. Once the unit is in place it only takes one hand.



DRIVING GEARED DIE STOCK with SIOUX No. 1508 Pipe Threader and No. 38002 Adaptor.



WIRE IS PULLED THROUGH CONDUIT with SIOUX No. 1508 Pipe Threader and No. 1509 Portable Winch.

Your SIOUX Power Pipe Threader will also thread bolts; drill; auger; and open and shut valves. (It's a versatile, portable power package!)

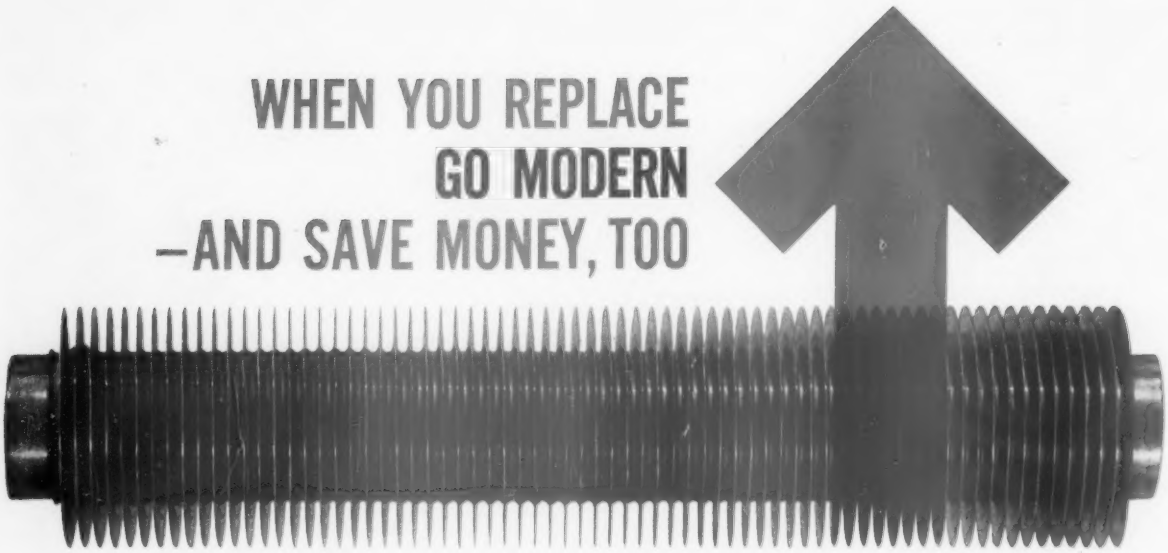
Look for SIOUX in the yellow pages under "Tools, Electric" or write to

ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U.S.A.

AIR IMPACT WRENCHES • AIR SCREWDRIVERS • ELECTRIC IMPACT WRENCHES • DRILLS • SCREWDRIVERS • GRINDERS • SANDERS • POLISHERS • FLEXIBLE SHAFTS • PORTABLE SAWS • VALVE GRINDING MACHINES • ABRASIVE DISCS

WHEN YOU REPLACE GO MODERN —AND SAVE MONEY, TOO

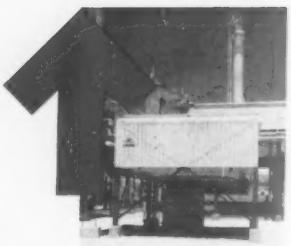


Aimco offers exclusive design— unequalled for heat transfer efficiency

If your present air-cooled equipment is structurally and mechanically sound, modernization through replacement of existing cooling tubes with Aimco fintubing may easily pay for itself through greatly increased efficiency in heat dissipation.

Aimco fintube is fabricated on special patented machinery that gives it a uniform, tapered spiral design, forming a mechanical bond to the seamless tube – regardless of the materials used. Wrapped continuously on the tube, fins form a tight and permanent seal which prevents exposure of the base tube to the atmosphere, protecting it against corrosion as well as rust in steel tube application. Once formed on the tube, fins will not uncoil or work loose through changes of temperature, pressure, or even vibration. *All performance tests conducted prove that exclusive Aimco design gives highest heat transfer efficiency – therefore most economical heat dissipation!*

Whatever your particular requirements, you get the very best when you specify Aimco, quality leader in fintubing.



For the complete package on a new or replacement air-cooled heat exchanger, specify reliable Transaire, ideal for many varied processing operations. Full information on request.

Yuba also manufactures a complete line of shell and tube heat exchangers, and will recommend either type, whichever is required or best suited for the job.

YUBA

specialists in heat transfer equipment

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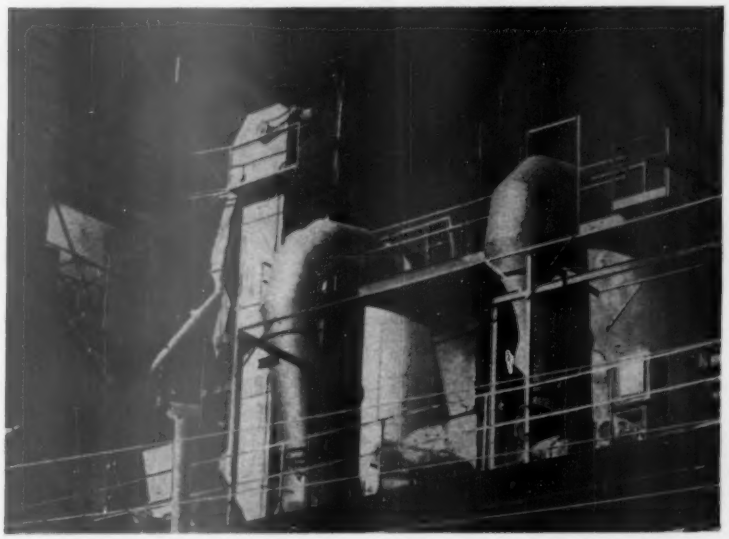
Found: A Paint that Lasts



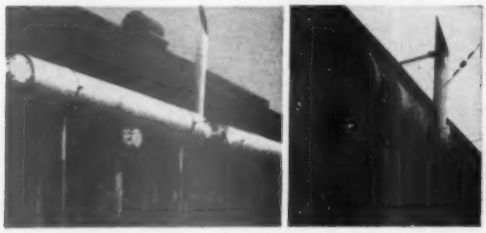
Cut Costs with New Long-Lived Silicone Finishes

You paint your plant to protect against rust and rot, but how can you protect the paint? Sun, rain, heat, sleet, smoke, and other elements of the industrial climate take a heavy toll. Shortly after the paint is completely dry, it starts to deteriorate. Soon, it must be re-applied. Thus, the cost of keeping away rust can run high: not due to the price of the coating material as much as to the repainting time involved.

Now, however, new paints based on silicone resins make it possible for you to make some really substantial cuts in paint maintenance costs. Proven to have superior durability, these silicone finishes last a good 25% to 100% longer. They keep their gloss and color and film integrity despite tough exposure to weather . . . despite high temperatures that burn or crack conventional finishes.

Naturally, this greater staying power means fewer repainting jobs. And that's especially important in hard-to-get-at areas of the plant, or on hot-running equipment that must be shut down for painting.

For instance, the Austin White Lime Company, of Austin, Texas, had difficulty keeping paint on the kilns and stacks shown above. Then they tried a paint based on Dow Corning Silicones, and report it ". . . by far the most satisfactory paint we have ever used." You can see the gleaming results.



Many other firms have come to the same conclusion. At left are two diesel mufflers at the Philadelphia Gas Works. Both were painted two years before these pictures were taken; one with an organic coating, the other with a silicone finish. The burned, cracked and discolored paint is the organic; the "like-new" coating is the silicone.

What if there's no heat problem, just weathering? New silicone-based coatings outlast conventional paints even where high temperatures are no problem. Look at the test panels in the photo. These panels have been exposed for one year in an industrial location where corrosive atmospheres frequently prevail. The conventional organic paint has faded, lost its gloss and chalked badly, while the silicone finish (bottom) is still in fine shape.

Colors Unlimited . . . Silicone finishes run the complete spectrum. If you want a hot-spot finish that will resist 1,000 F, certain pigments such as aluminum must be used.

But, when temperatures are not high enough to damage the pigment, you can get virtually any color you wish. This is important, for it means that, for the first time, you can carry color-coding systems over onto hot equipment without worrying about early paint failures.

Product finishes based on Dow Corning Silicones further prove the resistance to chalking, checking, fading and oxidation of these resins. For example: Sherer-Gillett, Marshall, Mich., a major producer of refrigerator display cases for supermarkets, has found a silicone-based enamel superior in durability . . . retaining high gloss after long wear . . . capable of absorbing more abuse.

Why not investigate silicone paints for your plant? Send today for the descriptive brochure, "Why Silicone-Based Paints Mean Less Maintenance." Write Dept. 2904.

Your nearest Dow Corning office is your number one source for latest information and technical service on silicones.

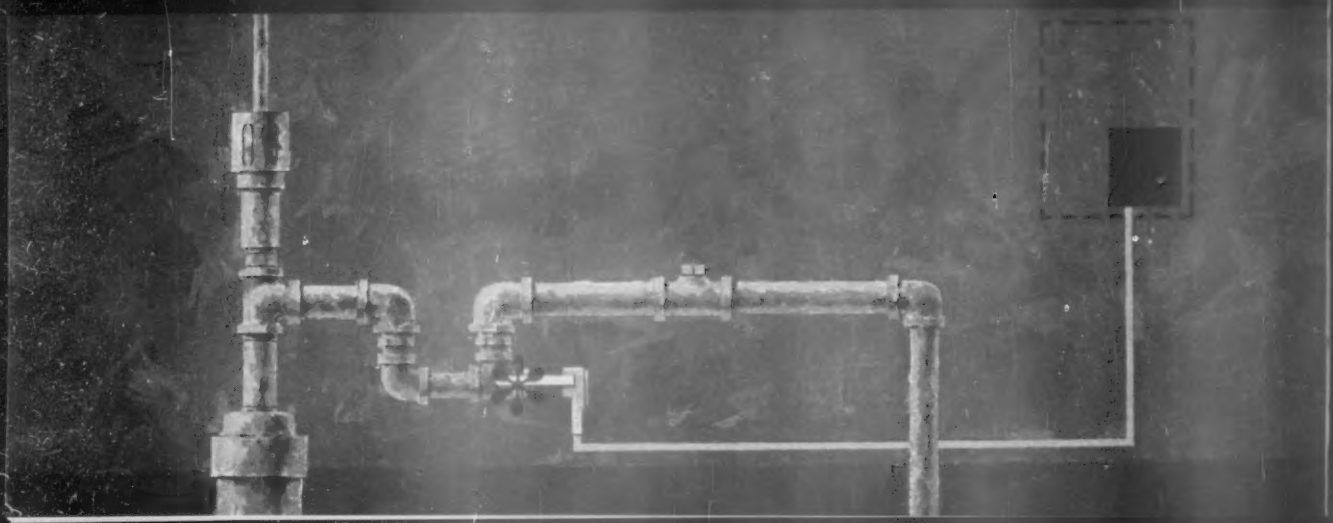
first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

New oil well control development from Cutler-Hammer

The Cutler-Hammer thermistor detects pump off, then signals transistorized relay which shuts off pump.



CONTROL

At last! An automatic pump off control that ends dry pumping!

- *Cutler-Hammer's exclusive pump off control for oil wells eliminates severe wear from dry pumping*
- *Cuts pumping time up to 25%, yet maintains maximum oil production . . . saves electricity, too*
- *Field tested for 2½ years . . . proved to lower oil lifting costs*

Now one of the biggest problems in oil well production is solved.

The new Cutler-Hammer Automatic Pump Off Control takes the guesswork out of figuring pump off time.

An ingenious sensing probe, (an electrically self-heated thermistor) measures fluid flow electrically. When the well pumps off, the thermistor signals the transistorized relay which in turn shuts off the pump. *Fluid flow* is the gauge—no other factors influence pump off.

You get maximum oil production without undue wear and maintenance. Even under rapidly changing well characteristics the pump off control matches pumping schedules to well production—a real aid to pumpers.

By preventing just one pump overhaul you save enough to pay for a half dozen or more Cutler-Hammer pump off controls. You can't afford to be without them. This unique control is easily installed with any size pump. Better get Pub. LO-16—G275 now for full details.

What's new? This new, *better* product is a typical example of what you can expect from the new Cutler-Hammer. We've added new plants, new engineering talent, even a new trademark that symbolizes our new capabilities for the demanding decade ahead. Find out more about our new problem-solving capabilities soon.

WHAT'S NEW? ASK...

CUTLER-HAMMER

CONTROL

Cutler-Hammer, Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C.A. • Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer, Mexicana, S.A.

SEE! The new Cutler-Hammer Automatic Pump Off Control at the PIEA and PESA Show—Kansas City, Mo., April 12, 13, 14

another
TRETOLITE SERVICE
report

SOLVO®
PARAFFIN REMOVER

. . . prevents paraffin accumulation

ELIMINATES COSTLY WELL-PULLING, STEAMING, CHEMICAL CLEANING

In few places is the wisdom of the "ounce of prevention" more evident than in treatment against paraffin accumulation.

Corrective measures such as well-pulling, steaming, and chemical clean-out are costly, and they are only temporary at best. They provide no permanent corrective answer to the problem and paraffin accumulation will soon be back, requiring another treatment.

SOLVO* Paraffin Remover corrects by preventing

In many applications SOLVO will remove paraffin deposits, but it is most effective and economical when used in a planned program of *preventive treatment.*

What SOLVO is

SOLVO Paraffin Removers are organic liquids, dispersible in both oil and water. They contain no carbon bisulfide or carbon tetrachloride and are essentially chloride-free. This is important to the refiner. SOLVO Paraffin Removers are safe to use because they have high flash points, low vapor pressures.

Ask your Tretolite field service engineer (the "Man in the Red Car") for more facts and figures on SOLVO-preventive maintenance in *your* wells.

*Registered trademark of Petrolite Corporation

TPR-60-2

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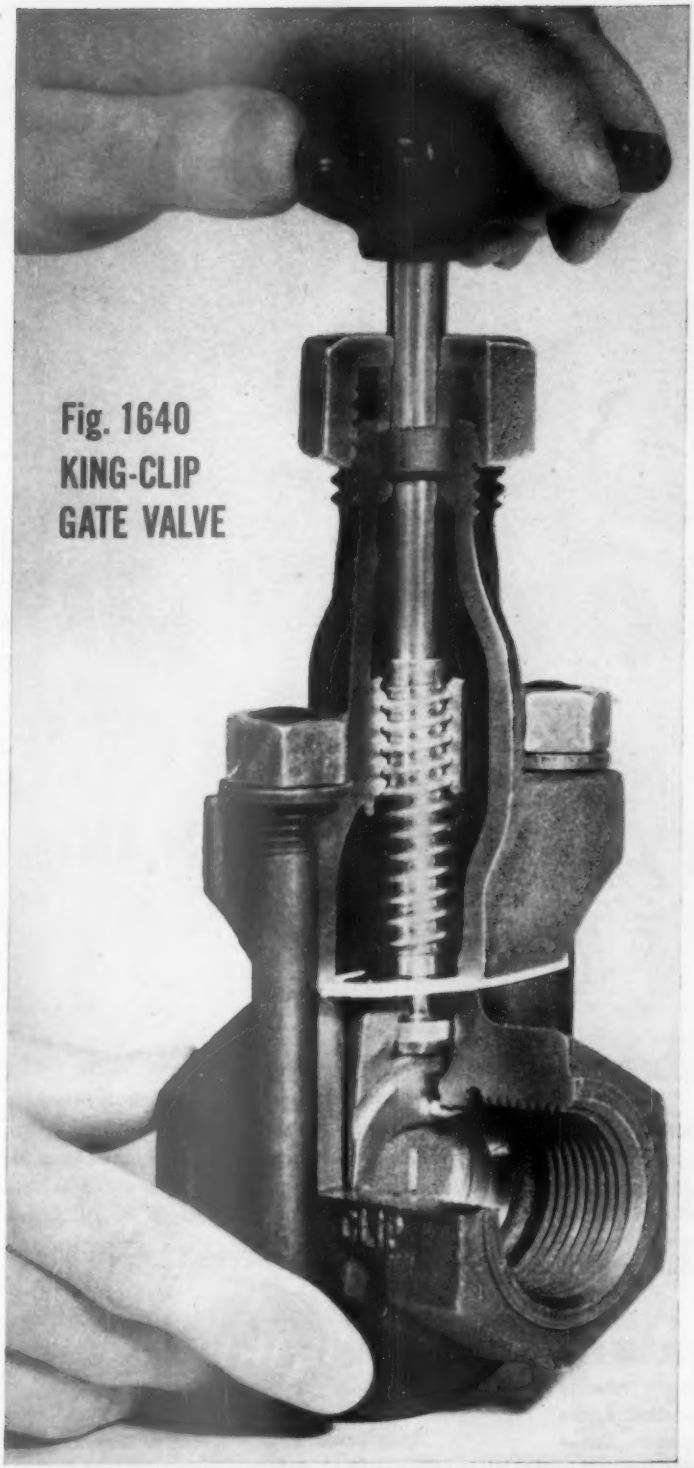


NOW you can SEE why

THE ORIGINAL KING-CLIP® VALVE by LUNKENHEIMER CUTS MAINTENANCE

Feature-for-feature, it's easy to *see* why King-Clip outperforms other clip valves . . . keeps maintenance costs low. Its precision-machined *Stemalloy® stem* assures longer stem thread life. *Seats and discs* are precision fitted to assure tight closure, even through thick liquids. *Extra-long pipe threads* extend deep into the body for pressure-tight connections. *Bodies* are rigid and extra-sturdy. And the exclusive *Non-Slip® handwheel* makes opening and closing easy—even with wet or oily hands.

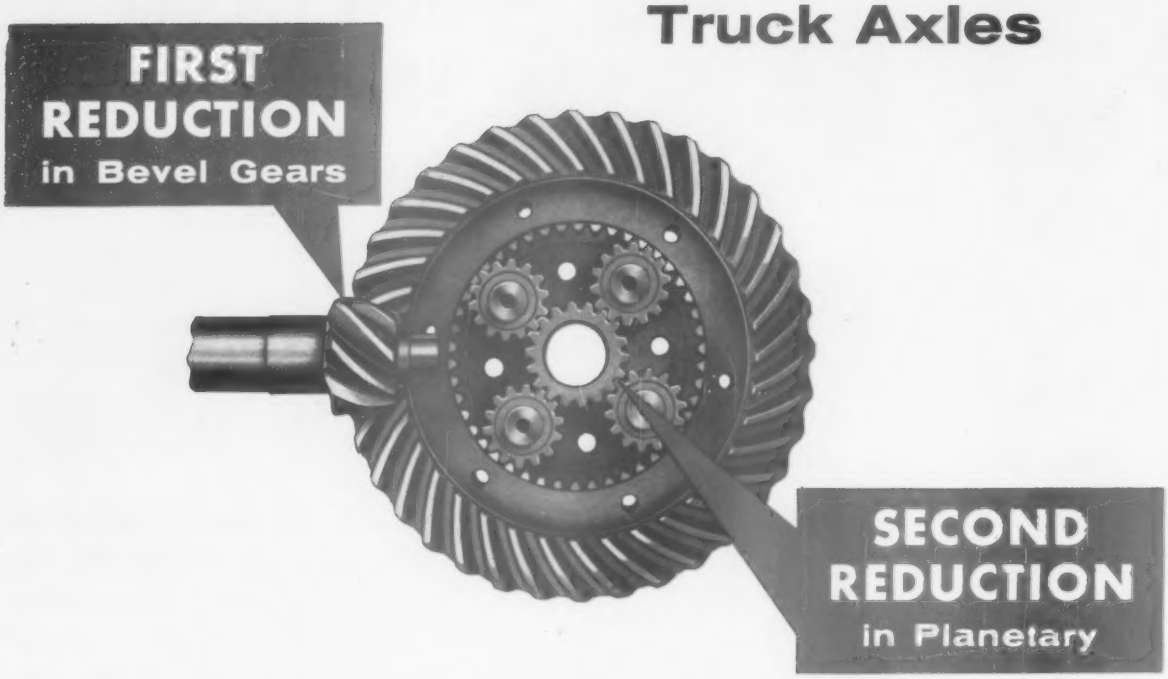
Your Lunkenheimer Distributor will be glad to show you the important differences between King-Clip and other clip valves. He will arrange a comparison test that will show why King-Clip cuts maintenance costs . . . assures longer-lasting service. Or write The Lunkenheimer Co., Cincinnati 14, Ohio.

LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

A New Concept in Double Reduction Truck Axles



Eaton Planetary Double Reduction

Gives You these Important Benefits!

Save Weight—Size for size, Eaton PDR Axles weigh less than conventional herringbone or spur gear axles, permit truckers to haul more legal payload.

Last Longer—In Eaton PDR Axles, gear tooth loads are equally distributed over four rugged "planet" gears; stress and wear are reduced, resulting in materially longer axle life. Eaton's forced-flow lubricating system provides positive lubrication to all moving parts, even at slowest vehicle speeds—a feature not available in other double reduction axles.

Cost Less to Maintain—When and if repairs are necessary, parts are readily available—most of them interchangeable with other Eaton Axles. Simple construction—similar to the famous Eaton 2-Speed Axle, with which all truck service men are familiar—holds maintenance labor to a minimum.

Previously, double-reduction axles have been available only in the extra heavy-duty sizes. Eaton PDR Axles are available in a wide range of sizes—the last word in equipment to meet the demands of today's hauling conditions. By actual comparison they cost less to buy, less to maintain. They have established outstanding performance records in all types of heavy-duty operation.

EATON

Ask your Truck Dealer for Complete Information about Eaton PDR Axles

EATON AXLE DIVISION MANUFACTURING COMPANY CLEVELAND, OHIO

This high strength Spang Extreme Line Casing is ready for use in a Texas well. Extreme Line Casing is readily available in grades J-55, N-80 and P-110 to meet every well condition.

Unique metal-to-metal seal makes Spang Extreme Line Casing 100% leak resistant

Integral joint Extreme Line Casing was first developed by Spang engineers to provide exceptional strength for extreme well conditions.

No other casing gives you comparable positive resistance to leakage, streamlined integral joint design, or faster running speeds under adverse conditions. Precision machined metal-to-metal seals on male and female ends bear up under the heaviest loads in tension and compression.

on the next pages:

Specific reasons for SPANG Extreme Line superiority

16

Specifics prove Spang Extreme Line Casing is superior for deep, high-pressure wells

PRECISION MANUFACTURING FACILITIES
Special precision production equipment has been developed by National Supply to produce Extreme Line Casing. All manufacturing steps —steel selection, piercing, upset forging of ends, thread and seal machining—are carefully controlled.

STRINGENT INSPECTION PROCEDURES
Close tolerances of Extreme Line Casing require exacting inspection by highly skilled personnel. Special quality controls, such as thread gauges, microscopic projections, Magnaglo inspections and hydrostatic pressure test, assure perfection of the casing.

UNIQUE DESIGN FEATURES
Positive resistance to leakage is effected by special metal-to-metal seals. A curved surface extending beyond the male threads seats precisely under predetermined pressure into a conical seat at the end of the female threads.

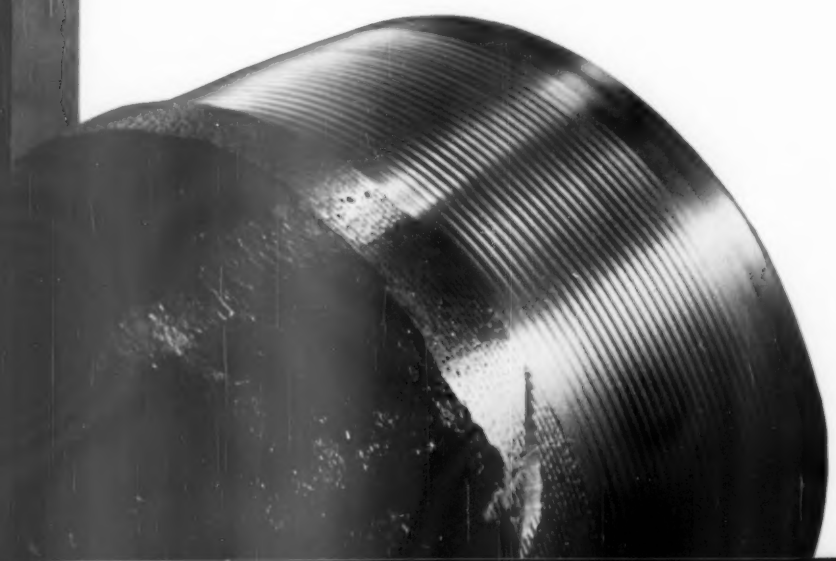
Broad, flat modified Acme threads engage mating members and draw them together in a joint that is shoulder tight.

Pitch and taper of Extreme Line Casing threads permit deeper stabbing and require less make-up than T&C.

Elimination of the coupling reduces outside diameter. Streamlined exterior affords greater clearances than T&C casing.

Extreme Line Casing has the mechanical and metallurgical properties to withstand the most severe pressures you encounter. It can be salvaged and re-run repeatedly.

Investigate the many advantages of this superior quality casing for your deep, high-pressure wells. Call the National Supply representative in your area for complete details.



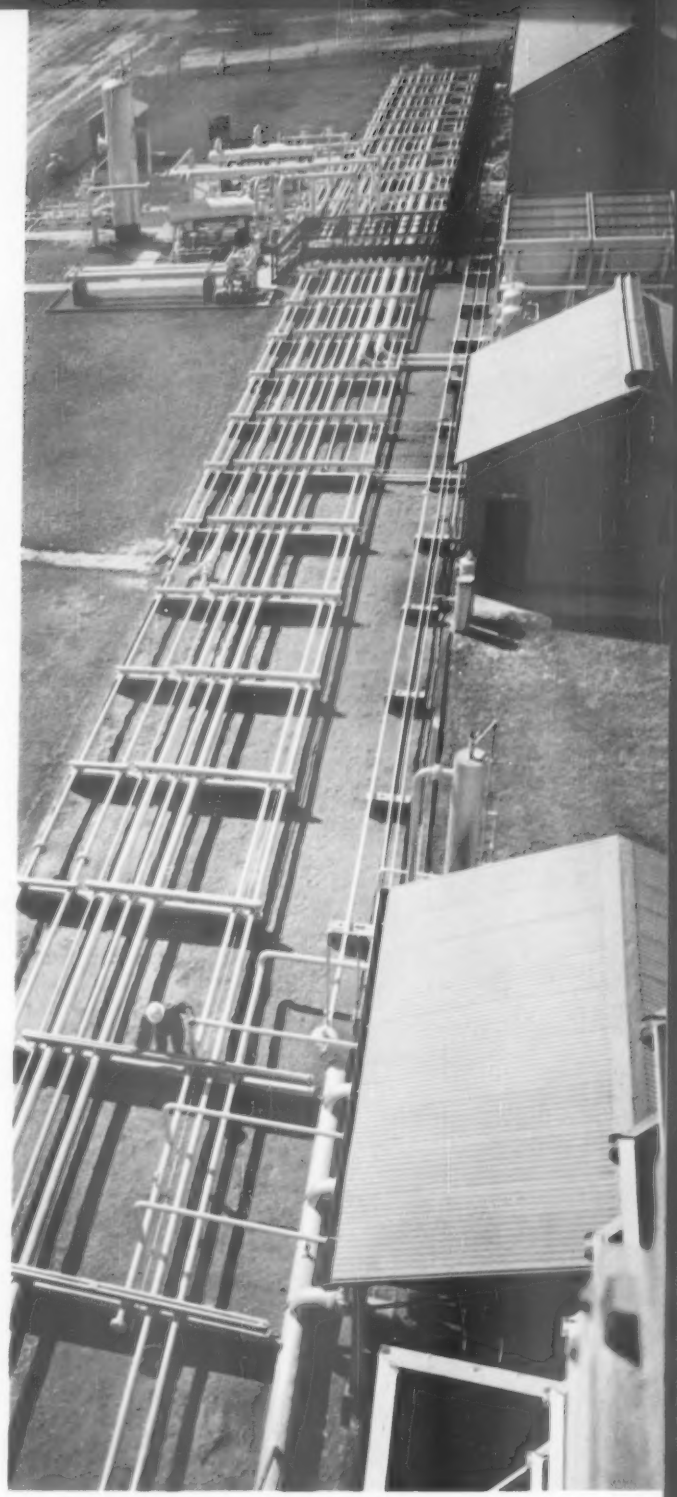
Spang Quality CW steel pipe speeds installation ... it's easy to cut, bend, thread and weld

Special quality Spang CW steel pipe can save you time in laying, gathering and feeding lines.

Spang quality control in every manufacturing step is the answer. Every length of pipe is hydrostatically tested and inspected for thread quality and uniformity. Every length is made of carefully selected steel that meets the toughest standards.

This quality control assures you of pipe that is easy to work, because it is easy to cut, bend, thread and weld.

And most important—there is no premium price for Spang quality. All sizes—plain end or threaded and coupled—are available now. Call your nearby National Supply Store for your next order.



This Spang CW steel pipe is installed at a recycling plant in Texas. The pipe is strong, durable, with smooth finishes—inside and outside.

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

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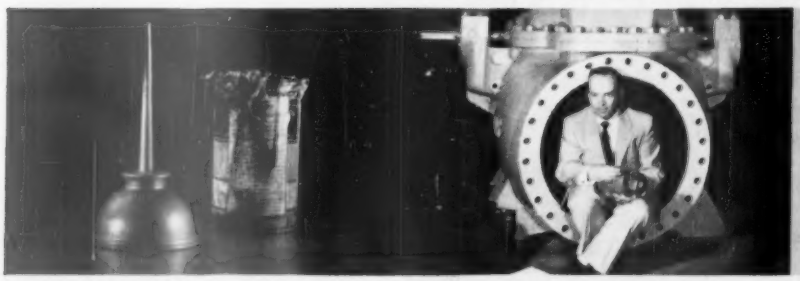
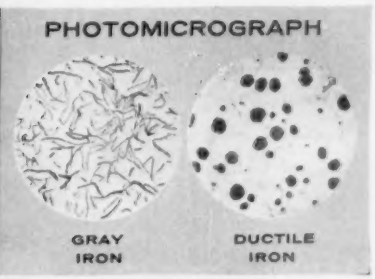
PUMPAGE

Goulds news about pumps for process industries





Lubricate with oil or grease?

If all you're thinking about is lubrication *per se*—oil is better than grease. It's easy to cool, stable, easily replaced. But . . . there are problems. Oil, contaminated by even tiny amounts of moisture, fumes, dust, shortens bearing life. Keeping oil level right for both small and large bearings is difficult. Grease lubrication almost completely solves these problems. It forms a barrier that keeps contaminants from reaching the bearing. It doesn't churn through the bearing, bringing contaminants with it. It *ends* the problem of lubricant level. We feel that grease is a good universal lubricant for pumps and a majority of our new units are available with *either* oil or grease lubrication . . . you have your choice of lubricant to meet the needs of any application.

Centrifugals for cooling towers

You can pump up to 40,000 gpm from your cooling towers with the mammoth Model 3420 centrifugal pump you see here. Or, if you want the same capacity but more flexibility, try a pair of Model 3405's. In either case, you get a pump that's a cinch to work with should you ever want to go inside it. Horizontally split casing comes apart easily when you remove a few bolts. You don't disturb piping, pump, or driver alignment. You look inside, adjust, maintain in a matter of minutes. Both the Model 3405 and the big job (Model 3420) have proved themselves under the severest services. For construction details, ratings and specifications write us for Bulletins 721.6 and 721.8.

The ductile iron difference

To make ductile iron, magnesium is added to molten cast iron, changing the sharp, thin graphite flakes to spheroids. The spheroids have large areas of iron matrix between them, and since they have no sharp edges, the ductile iron has far greater strength than the original cast iron.

Ductile iron is so tough it can be used in many applications previously requiring cast steel.

It might pay you to look into this. Write us for information on ductile iron pumps or parts.

Intermediate range design... new way to handle hot pumpage

You know how it *used* to be—you bought a light duty pump for temperatures up to 200° and a real heavy duty pump to go from 200° to 800°. Consequently, when you were operating in the intermediate range—that area of temperature between 200° and 650°F—you usually had more pump than you needed. Well, that's changed. Here's a process pump that fits into the intermediate range like a glove. It handles all light duty applications and the growing number of intermediate applications as well. Yet it costs very little more than a light duty pump with built-in temperature limitations. For complete application data, drop us a line asking for our bulletin on the Model 3775.

Points on a close-coupled process pump

Here's a brief bulletin—but one loaded with facts—on the Model 3675 close-coupled process pump. It gives you complete specifications on this compact, economical pump which we built expressly for the petroleum industry. It contains full construction details, dimensions, and a handy pressure-temperature chart. For your free copy, just drop us a line. Goulds Pumps, Inc., Dept. OGJ-40, Seneca Falls, N. Y.

GOULDS PUMPS

BANTAM'S big-rig features do more . . . earn more

Here's the most modern crawler mounted crane-excavator ever built—the BANTAM C-350! For capacity, performance and profit-making versatility, BANTAM has all the big-rig features that you want: the fastest work cycles, widest work range, biggest choice of equipment.

The ideal high-production pipeliners' crawler rig, BANTAM C-350 has standard 2-speed, independent travel permitting you to lift, swing and travel all at the same time. On big or small jobs, BANTAM with back hoe digs over 100′ of 5′ trench per hour. Add the optional BANTAM long-boom back hoe, and you dig to 18′10″ without "digging in" first to get that extra depth.

Crawler BANTAM goes everywhere!

BANTAM's low ground-bearing pressure (less than 3 lbs. per sq. inch with 32″ pads) and resulting high flotation let you go over *any* terrain without bogging down. And BANTAM's fast-acting, easy-operating mechanical controls are never affected by freezing, heat or moisture—completely maintenance-free.

BANTAM's advanced, rugged design outdates all others and assures you of years of trouble-free service on all kinds of jobs. It's travel-ready at all times—with no disassembly or special permits needed. You save time coming and going, as well as on the job.

Work and earn with 11 BANTAM-built attachments

BANTAM handles all your excavating and lifting chores, working with 11 fast-change attachments. In addition, more than 25 optional features let you equip your BANTAM to match your specific needs.

Another popular BANTAM for pipeline operations—the carrier mounted BANTAM T-350. Husky 11-ton lifting capacity and easy, permit-free mobility make this BANTAM the mobile work leader of its size. Works and earns with all BANTAM-built attachments. Check the self-propelled BANTAM CR-350, too—one-man, one-engine operation. 4 x 4 drive optional.

Get the facts that prove BANTAM's superiority in speed and savings over any other rig in its class. Write for complete details today!

PC-282

SCHIELD Bantam Co.

243 Park Street, Waverly, Iowa

WORLD'S LARGEST PRODUCER OF TRUCK CRANE-EXCAVATORS

They Say—

No persecution here

Dear Sir:

Recently I have read several articles which criticize the U. S. Government, its agencies, its policies, and its employes. In fact, if one believed everything printed about the Government, he would surely seek refuge in another country.

I realize that some people make a living by writing such articles, but when someone writes such things as "J.D.H." (OGJ, Mar. 28, "They Say," p. 77), my "dander" begins to fly.

As a former valuation engineer with the Internal Revenue Service, I cannot see how anyone can say that citizens can be persecuted by an employe of the Internal Revenue Service.

Only those people who break the laws, rules, and regulations are prosecuted by law and not persecuted by an employe.

If a person does not like the laws, he should attempt to get his congressman to change the laws and not make such a ridiculous statement as the Government and the employes of the Government are persecuting the people.

Thomas M. Garland
Wichita Falls, Tex.

There's a difference!

Dear Sir:

It has been pointed out that the article on isocracking (OGJ, Mar. 28, p. 127) contains an error in Table 1 "Isocracking Turns in Good Performance in Upgrading Middle Distillates," (p. 128).

The hydrofined feed stock ASTM distillation 5% temperatures should have been labeled IBP temperatures instead.

W. H. Claussen
Manager,
Invention Development
California Research Corp.
San Francisco.

Missing minus signs

Dear Sir:

I have noticed a couple of typographical errors in the first two published parts of my paper on linear programing (OGJ, Mar. 7, p. 113, and Mar. 21, p. 108).

These errors consist of dropped minus signs. One minus sign is missing in Part 1 and five minus signs are

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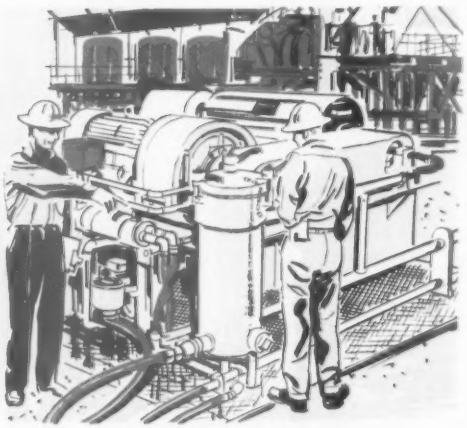
ANOTHER
HOMCO-ASSOCIATED
RENTALS REPORT

"I Saved more than $40,000 with the Homco Mud-Miser from Homco-Associated's New Iberia yard...

Report from a Louisiana Drilling Contractor.

"On location in Louisiana a lime base mud was used, weighted to 18 pounds per gallon. Due to high bottom hole temperature, it was difficult to keep the mud in a fluid condition. Bottom hole temperature in this area has been measured as high as *315° Fahrenheit*. Pulling the pipe swabbed the hole badly, and running it occasionally caused a loss of circulation.

When 12,693 feet was reached, the mud viscosity was extremely hard to control, due mainly to high solids contamination. The mud bill on this well was $127,232.00 to a depth of 12,829 feet.



The compact **Mud-Miser Centrifuge Unit**

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HOUSTON, TEXAS — HEADQUARTERS

ASSOCIATED OIL FIELD RENTALS

ALSO OFFERS

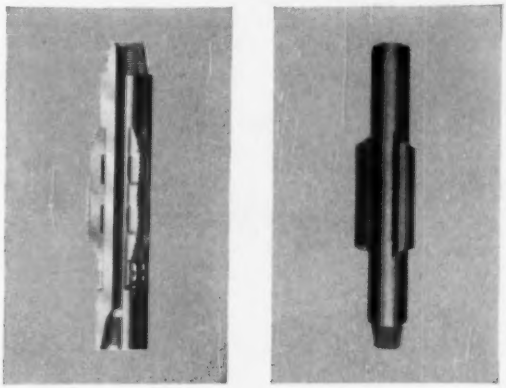
Electrical Well Services · *Fishing & Cutting* · *Directional Drilling* · *Complete Supply Service*

and I learned that the Mud-Miser was just one of the more than 55,000 tools I could rent from any one of their 15 yards"

HOMCO
ASSOCIATED A OIL FIELD RENTALS

Due to mud trouble and high mud cost, *the operator decided to use a Homco Mud-Miser.* In one of the several wells drilled using a Mud-Miser to treat the mud, we drilled to 16,000 feet, incurring a mud bill of $87,971.00 *including rental on the Mud-Miser.* This is an impressive saving over the $127,232.00 for the 12,829 foot hole in the *same area.* It was further noticed, in the well that was drilled to 16,000 feet using the Mud-Miser, that the viscosity was easier to control — there was no swabbing action — and a better hole condition prevailed throughout the entire drilling operation."

Homco-Associated offers the world's largest selection of oil field rental equipment from yards located strategically throughout the oil country. Planned use of this equipment can free substantial amounts of your operating capital and increase your profits.



Typical of other rental items available are Homco Stabilizers, furnished with welded or replaceable blades, plain or with Homco's exclusive Klustrite® application.

Central Control Panel. The entire system is operated by a series of electrical controls on a single panel board providing complete "automatic control".

Price book contains complete engineering and specification tables. Available to operators on request.

Rental Export Inquiries Invited

OVER 55,000 RENTAL ITEMS . . .
the world's largest selection of oil field tools, ready for you at HOMCO-ASSOCIATED

Hauls flat-car size loads up and over loose blow-sand . . . mile after mile through Pakistan . . . Libyan Deserts

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After 27 months of highly-successful operation, a team of LeTourneau Transporters has been moved from West Pakistan to Libya's "Sea of Sand" . . . where other Transporters have been at work with outstanding results. These machines haul 30-ton loads up steep grades and over loose blow-sand that bogs down conventional equipment . . . and do it on runs covering hundreds of miles.

Powerful electric winches and sturdy gin-poles drastically reduce rig set-up time as well as take-down time—further cutting costs in drilling operations. Thoroughly proved on-the-job, Electric Wheels now drive Transporters over trackless deserts, up and down steep mountain ranges, and through sticky jungle mud.

LeTourneau Transporters are conquering some of mankind's toughest transportation problems in all parts of the world.

Full technical and operating information will be sent to you on request—at no obligation.

R.G. LETOURNEAU INC

2864 SOUTH MacARTHUR, LONGVIEW, TEXAS

TIII

missing in Part 2. Such dropped minus signs could cause some confusion.

John E. Chenevey
Coordinator of
Optimization Planning
Manufacturing Department
Continental Oil Co.

(Editor's note: Missing minus sign in the March 7 article is on page 114, column 2. Under point three, the term 6A should be —6A. In the March 21 issue, minus signs are missing on page 109, second column: Z should equal —1,000. On page 110, equations 5A: Z should equal —1,000. In equations 5B: Z should equal —1,000.)

Compliments

Dear Sir:

My compliments to The Oil and Gas Journal on the very excellent editorial in the issue of March 7 ("Enough of this Brinkmanship," p. 55).

M. Lloyd Freese
Vice President
Bell Oil & Gas Co.

Hooray for Henry

Dear Sir:

Too few have lauded the wit, wisdom, and weight in the oil business of Henry Ralph. Here we have a truly great. Get on your horses some of you type-pecking, ink-slinging subscribers of high rank and complete this accolade.

John Daley
San Francisco.

(Editor's note: Henry says thanks!)

Socony on tankers

"Socony Mobil Oil Co., Inc., is opposed to the proposal before the Office of Civil and Defense Mobilization that seeks a mandatory order requiring 50% of oil imports to be carried in U. S.-flag tankers.

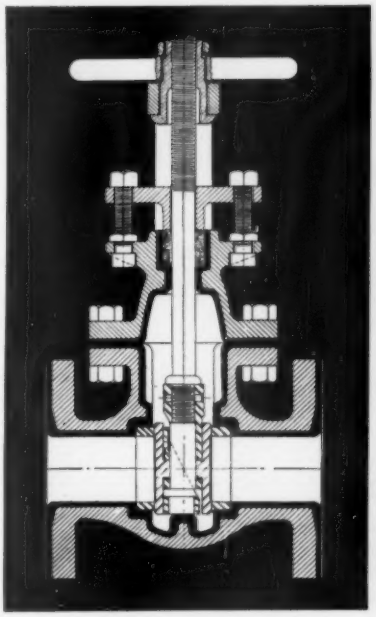
"The order is not necessary to insure the availability of an adequate tanker fleet to meet U. S. defense needs.

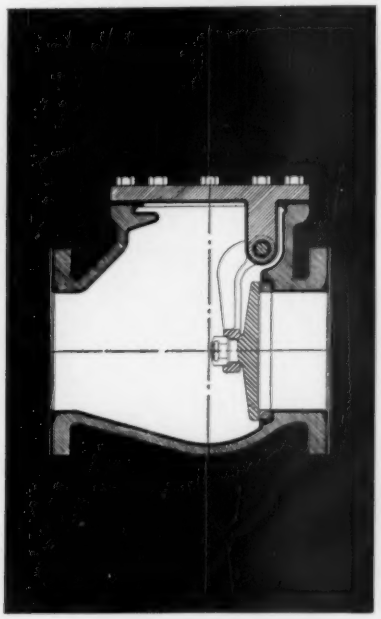
"A U. S.-flag tanker fleet of 6,500,000 dwt already exists, and can be augmented in times of emergency by 9,000,000 dwt of Panamanian and Liberian tanker tonnage that is owned by U. S. citizens. The availability of Panamanian and Liberian vessels to meet U. S. defense needs has been attested to by government officials and was proved during World War II and the Korean War.

"A mandatory order would be contrary to the policy of every U. S. administration since the early 1930's.

Cost cutters for corrosive service

Why pay for expensive special alloy valves when IRON BODY VALVES with hard rubber lining may solve your problem more economically?





RUBBER-LINED IRON BODY GATE VALVES

In many cases, you can save the cost of expensive alloy valves for corrosive or abrasive service. Darling rubber-lined gate valves offer you these advantages:

1. Iron body substantially reduces cost over special alloy valves.
2. Special hard rubber lining on bodies and bonnets (see diagram) provides high resistance to corrosion and abrasion.
3. Revolving double disc parallel seat and "no pocket" discs provide positive sealing and assure ease of operation.

Available in outside screw and yoke type, in sizes from 2" to 24". Write for further information.

RUBBER-LINED IRON BODY CHECK VALVES

Streamlined body design has been especially selected for application of hard rubber lining. Excess area through the valve minimizes abrasion and assures full delivery of line capacity.

A slight pressure on the pump side of the valve will immediately unseat the disc. Yet valve remains tight when there is no differential pressure on either side of disc.

Interior working parts are made of suitable corrosion resistant alloy. Yet the iron body substantially reduces overall cost.

Designed for 175-lb. working pressure. Available in sizes from 2" to 24". Write for further information.

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Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

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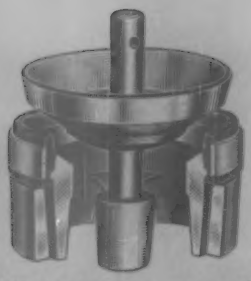

Mission MUD MONARCH®

Mission SILVER TOP®

ONE OF THESE MISSION VALVES AND SEATS WILL GIVE YOU THE MOST FOR YOUR MONEY

Because Mission Valves and Seats are designed to give you the most for your particular service. For *extremely high pressures*, the Mud Monarch® with an effective seal ring even when body and seats are severely worn. Compound 308® and Compound 711 inserts are available. For *medium pump pressures*, the Mission Super Service, with four cross arms for extra strength. And for *low and medium pressures*, the Silver Top with replaceable, wear-taking bushing which greatly reduces valve seat replacement. Compound 308 inserts are interchangeable with Super Service valves. Longer life is built in to all Mission valves and seats to give the most with all popular makes of reciprocating pumps. At supply stores everywhere.

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This policy has sought the reduction of trade barriers and restrictive practices by other nations. A policy of an opposite nature might well engender a spiral of retaliatory actions.

"The added transportation costs resulting from the proposed discrimination to benefit a small minority would ultimately impose a penalty on U. S. consumers and taxpayers generally."

C. S. Teitsworth, senior vice president, Socony Mobil Oil Co., Inc., in a letter to the Director, Office of Civil and Defense Mobilization.

Who'll bring in the bacon?

"Pipelines cannot exist without being married to somebody who is going to guarantee the traffic . . . Politicians who howl for pipeline divorcement never say to whom they are going to be remarried."

William C. Kinsolving, president, Sun Pipe Line Co., in a speech to the National Association of Corrosion Engineers.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

APRIL

12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibition, Municipal Auditorium, Kansas City.

15-16 Society of Economic Paleontologists and Mineralogists, Permian Basin section, annual meeting, technical session and field trip, Windsor Hotel, Abilene, Tex.

15-16 Society of Economic Paleontologists and Mineralogists, Pacific section, annual spring field trip, Panoche Hills, San Joaquin Valley, California, and evening meeting, The Hacienda, Fresno, Calif.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

19-21 American Society of Lubrication Engineers, annual meeting and lubrication exhibit, Netherland Hilton Hotel, Cincinnati.

20 Chemical Institute of Canada, joint meeting, Quebec rubber and plastics group and Montreal section, Queen's Hotel, Montreal.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

21-22 Oklahoma State University, technical conference on heat transfer, Stillwater, Okla.

21-22 Texas Technological College, seventh annual West Texas oil lifting short course, Lubbock, Tex.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

25 University of Oklahoma, fifth annual conference on automatic control in the petroleum and chemical industries, Norman, Okla.

25-26 American Society of Mechanical Engineers, maintenance and plant engineering conference, Chase-Park Plaza Hotel, St. Louis.

25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.

25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.

27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

28-29 American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.

28-29 Pacific Coast Gas Association, distribution conference, Benson Hotel, Portland.

28-May 1 Mississippi Geological Society and Society of Economic Paleontologists and Mineralogists, Gulf Coast section, field trip to coastal Mississippi and southwestern Alabama.

29-30 Mississippi Academy of Sciences, Inc., Millsaps College, Jackson, Miss.

30 Geological Society of America, Rocky Mountain section, Black Hills area field trip.

MAY

1-3 Texas Independent Producers and

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On the Job with

IN PENNSYLVANIA—Transco's 164-mile Leidy Line, connecting their main line with a new storage field in the north-central part of the state, requires some of the Bethlehem 24-in. pipe to be laid almost straight up.

IN NEW MEXICO—Utex Exploration Company and Charles A. Steen of Moab, Utah, build a gathering line by laying 3-in. Bethlehem buttweld pipe right on the surface of the ground.

Our new mills are geared to turn out pipe in larger tonnages than ever before. And it's line pipe that's thoroughly dependable, too. Every length is straight and true to round and bevel, right up to specs, and rigorously tested and inspected at the mill.

It's easy to check all the facts about Bethlehem Line Pipe—just call the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA., *Export Distributor:* Bethlehem Steel Export Corporation

For strength
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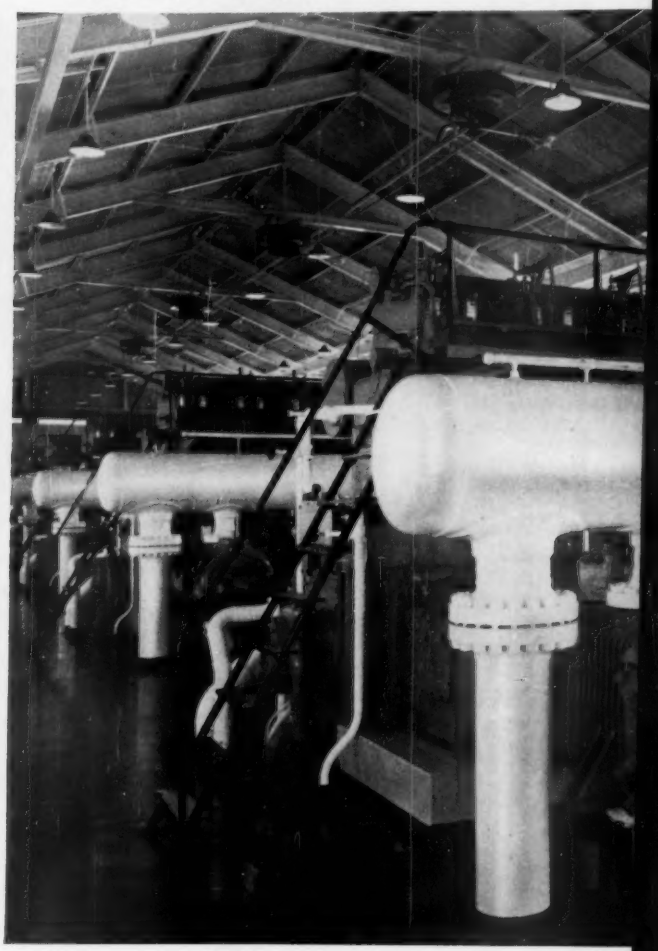
Bethlehem Line Pipe

IN VIRGINIA—Commonwealth Natural Gas Corporation pushes a looping line through the tangled Blackwater Swamp. The Bethlehem 12¾-in. pipe weathered the construction battle perfectly.

FROM COLORADO TO CANADA—Pacific Northwest Pipeline Corporation's 1,487-mile main line required 13 compressor stations, each using Bethlehem 22- and 26-in. Mayari R high-strength pipe exclusively.



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	SIZES (in., OD, incl.)	WALL THICKNESS (in.)	LENGTHS	SPECIFICATIONS
HYDRAULICALLY EXPANDED ELECTRIC FUSION-WELD (submerged arc)	18 to 42	¼ to ¾ incl.	40 ft	API 5LX, Grades X42, X46 & X52 Also X-56 (non-API)
ELECTRIC RESISTANCE-WELD	5⅝ to 16	API	to 60 ft	API 5L, Grades A & B API 5LX, Grades X42 & X46
CONTINUOUS BUTTWELD	½ to 4½	API	SRL 24 to 26 ft DRL to 50 ft	API 5L

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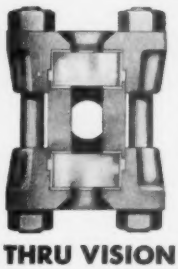

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	Royalty Owners Association, fourteenth annual membership meeting, Holiday Inn, Carlton and Blackstone Hotels, Tyler, Tex.
1-4	American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J.
2-3	Society of Petroleum Engineers of AIME, North Texas section, fourth biennial secondary recovery symposium, Wichita Falls, Tex.
4-6	Society of Petroleum Engineers of AIME, Rocky Mountain sections, and Canadian Institute of Mining and Metallurgy, petroleum division, joint meeting, Palliser Hotel, Calgary.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Statler and Sheraton-Cadillac hotels, Detroit.
9-12	Instrument Society of America, instrument-automation conference and exhibit, Civic Auditorium and Brooks Hall, San Francisco.
9-13	American Gas Association, distribution and transmission meeting, Jung and Roosevelt hotels, New Orleans.
11-12	University of Kansas, gas conditioning institute, National Guard Armory, Liberal, Kans.
11-14	Fluid Controls Institute, spring meeting, The Greenbrier, White Sulphur Springs, W. Va.
12-13	American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.
12-14	Kansas Independent Oil and Gas Association, annual meeting, Lassen Hotel, Wichita.
13-14	Southern Methodist University, School of Engineering, advanced technology seminar on heat transfer in electronics and direct conversion of heat to electricity, Dallas.
16-17	International Society of Professional Well Log Analysts, first annual meeting, Tulsa Hotel, Tulsa.
18-20	American Petroleum Institute, Division of Marketing, midyear meeting, Statler-Hilton Hotel, Cleveland.
22	Pennsylvania State University, short course in reservoir engineering, University Park, Pa. Term ends June 10.
22-26	Air Pollution Control Association, annual meeting, Netherland-Hilton Hotel, Cincinnati.
22-26	American Society of Mechanical Engineers, oil and gas power conference, and exhibit, Muehlebach Hotel, Kansas City.
23-24	American Gas Association, production meeting, Roosevelt Hotel, New York City.
23-26	American Society of Mechanical Engineers, oil and gas power conference and exhibit, Muehlebach Hotel, Kansas City.
24-25	Western Petroleum Refiners Association, computer conference, Ben Milam Hotel, Houston.
24-26	American Right of Way Association, annual seminar, Shoreham Hotel, Washington.
25-27	Pacific Coast Gas Association, accident prevention and transmission conference, Hotel Utah, Salt Lake City.
25-28	American Association of Petroleum Geologists, western Canada regional meeting, Banff Springs Hotel, Banff, Alta.
26-27	Natural Gas and Petroleum Association of Canada, meeting, Niagara Falls, Ont.

JUNE

1-3	Texas College of Arts and Industries, fifteenth annual short course

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This **new** 1000 wp. Tubing Head is safe, compact and economical.

1. 1000 psi Test—2000# psi Working Pressure.
2. The Top Nut contains three hammer-up lugs with ample striking surface and tong space. The hammer-up lugs are positioned to facilitate use of automatic slips.
3. The Type "K" Body has a 7⅝" OD 8 RD casing thread on top for the installation of valves or other equipment.
4. The Type "K" Body is furnished with two heavy 2" integrally formed side ports which are leak-proof.
5. The Top Packing Ring is cast by a precision process which provides two perfect halves. When assembled there is virtually no split through which rubber can flow.
6. The Top Packing Element is of Hycar and is the best, most oil and gas resistant compound available for such service. Also, it is newly designed for ease of installation and requires the minimum of make-up to provide a pressure-tight seal.
7. The Top Nut and Slip Bowl will accommodate all sizes of slips interchangeably, 1" through 3".
8. All parts in the Type "K" Head are identified as to Type, Size and where necessary, the Pressure Rating.
9. The Larkin Type "K" Tubing Head is compact, 10¼" overall, and is available with either male or female casing threads, 4½" through 7". The Type "SK" has an overall length of 14½".
10. Mandrel suspension with all the Type "K" quality is available in the Type "MK" Tubing Head.

The Larkin "K" Series Tubing Heads safely and efficiently help you effect **economies** in the 1000 lb. working pressure range. It is an important new addition for this service.

All Larkin Tubing Heads and Casing Heads are available . . . "Through Your Supply Store." Interchangeable parts are immediately available from the Larkin warehouse system which blankets the oil country.

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LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

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...Through Your Supply Store

Armour bactericides offer low cost corrosion protection!

Bacterial analysis of untreated water supply, by Armour technical service man, indicates the presence of 27,000 or more sulfate-reducing bacteria per ml. of water. Black coloration of broth medium indicates growth of sulfate-reducing bacteria.

ARMOUR INDUSTRIAL CHEMICAL

Armour's Duomeen® compounds are serving a dual purpose for oil field operators throughout the country. These Armour chemicals not only control bacteria effectively, but reduce corrosion as much as 95% . . . at costs as low as one mil per barrel of treated water.

Using these Armour chemicals, operators realize savings by reducing costly remedial measures such as acidizing, tubing replacements, etc. Further savings are also realized by less down time and lower power costs resulting from lower injection pressures.

Relying on established and industry-approved tests Armour strives to help operators improve and maintain peak production efficiency. These field tests aid Armour's technical service men in making time and money saving recommendations. In the case shown here, Duomeen CD-50 is used for control of sulfate-reducing bacteria in water floods. The small inset pictures illustrate the effectiveness of this Armour chemical.

For complete detailed information on Armour's bactericide-corrosion inhibitors and other chemicals for oil production, write for the booklet, "Armour Organics for Increased Oil Production." Samples of Duomeen CD-50 and other oil production chemicals for your own testing are also available.

Using Armour recommended treatment of Duomeen CD-50, colorless broth medium shown in inset indicates complete control of sulfate-reducing bacteria after 30 days incubation.

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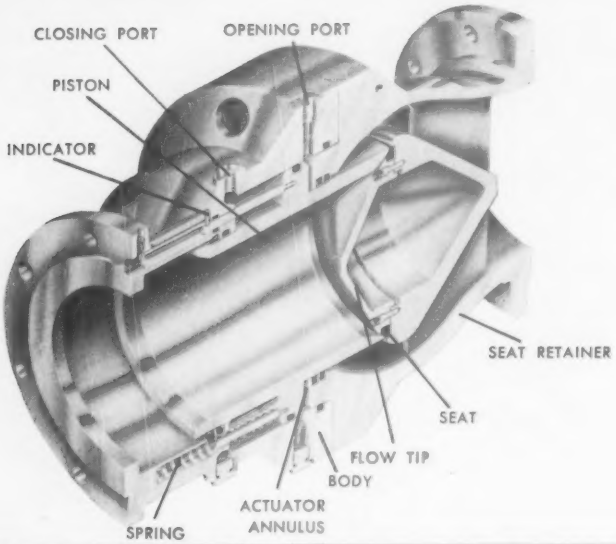
Bendix PISTON VALVES



For on/off and throttling service

Bendix Piston Valves have only *one* moving part—the piston. Since the actuator is an integral part of the piston with *no stem*, packing box or exposed motor, the valve has exceptionally high response as well as a minimum overall envelope. In addition, the streamlined flow path results in low pressure drop.

Valves can be provided in a wide variety of alloys to handle all types of fluids and chemicals over a wide temperature and pressure range. Sizes range from ½ to 24 inches with connections to suit individual needs. Flanged valves meet A.S.A. and I.S.A. standards.

Write for complete information or advise us your exact requirements and we will recommend the valve for your use.

QUICK FACTS

Balanced piston eliminates hunting for accurate control
Fast response gives precise control
Single seat assures bubble-tight shut off at any pressure
Installs in any position
Flow either direction
External diameter only slightly larger than flanges
Self operating from main line pressure
Can be operated by pneumatic, hydraulic, electro-hydraulic or electro-pneumatic

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on gas technology, sponsored by Southern Gas Association, Kingsville, Tex.

1-3 West Virginia University, fifth annual Appalachian underground corrosion short course, Morgantown, W. Va.

2 Pennsylvania Grade Crude Oil Association, annual meeting, Pennhills Club, Bradford, Pa.

2-3 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

5-9 American Society of Mechanical Engineers, summer annual meeting, Dallas.

5-10 Society of Automotive Engineers, summer meeting, Edgewater Beach Hotel, Chicago.

9-11 Manufacturing Chemists' Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

13-15 American Association of Cost Engineers, annual meeting, Rice Hotel, Houston.

13-15 Chemical Institute of Canada, annual conference and exhibition, Chateau Laurier, Ottawa.

13-15 Interstate Oil Compact Commission, midyear meeting, Statler Hilton Hotel, Detroit.

15-16 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

19-22 American Institute of Chemical Engineers, Instituto Mexicano de Ingenieros Quimicos, joint meeting, Hotel Del Prado, Mexico City.

22-25 Canadian Gas Association, annual meeting, Manoir Richelieu, Murray Bay, Quebec.

22-25 American Association of Petroleum Landmen, national convention, Ambassador Hotel, Los Angeles.

25-29 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alta.

25-July 5 First International Congress for Automatic Control, Moscow, U.S.S.R.

26-28 North American Gasoline Tax Conference, annual meeting, southern region, Eden Roc Hotel, Miami Beach.

26-July 1 American Society for Testing Materials, annual meeting and exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

27-28 Michigan Gas Association, Mackinac Island, Mich.

JULY

28-30 American Petroleum Institute, Division of Production, Eastern district meeting, The Greenbrier, White Sulphur Springs, W. Va.

AUGUST

3-5 Wyoming Geological Association, field trip to Snyder basin and Wind River Mountains, Casper.

14-19 National Congress of Petroleum Retailers, Inc., annual session, Shamrock-Hilton Hotel, Houston.

15-17 American Society of Mechanical Engineers, American Institute of Chemical Engineers, heat transfer conference and exhibit, Statler Hilton Hotel, Buffalo, N. Y.

15-26 Sacramento State College, summer institute on nondestructive testing, Sacramento, Calif.

22-26 Gordon Research Conference, catalysis, Colby Junior College, New London, N. H.

29-31 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

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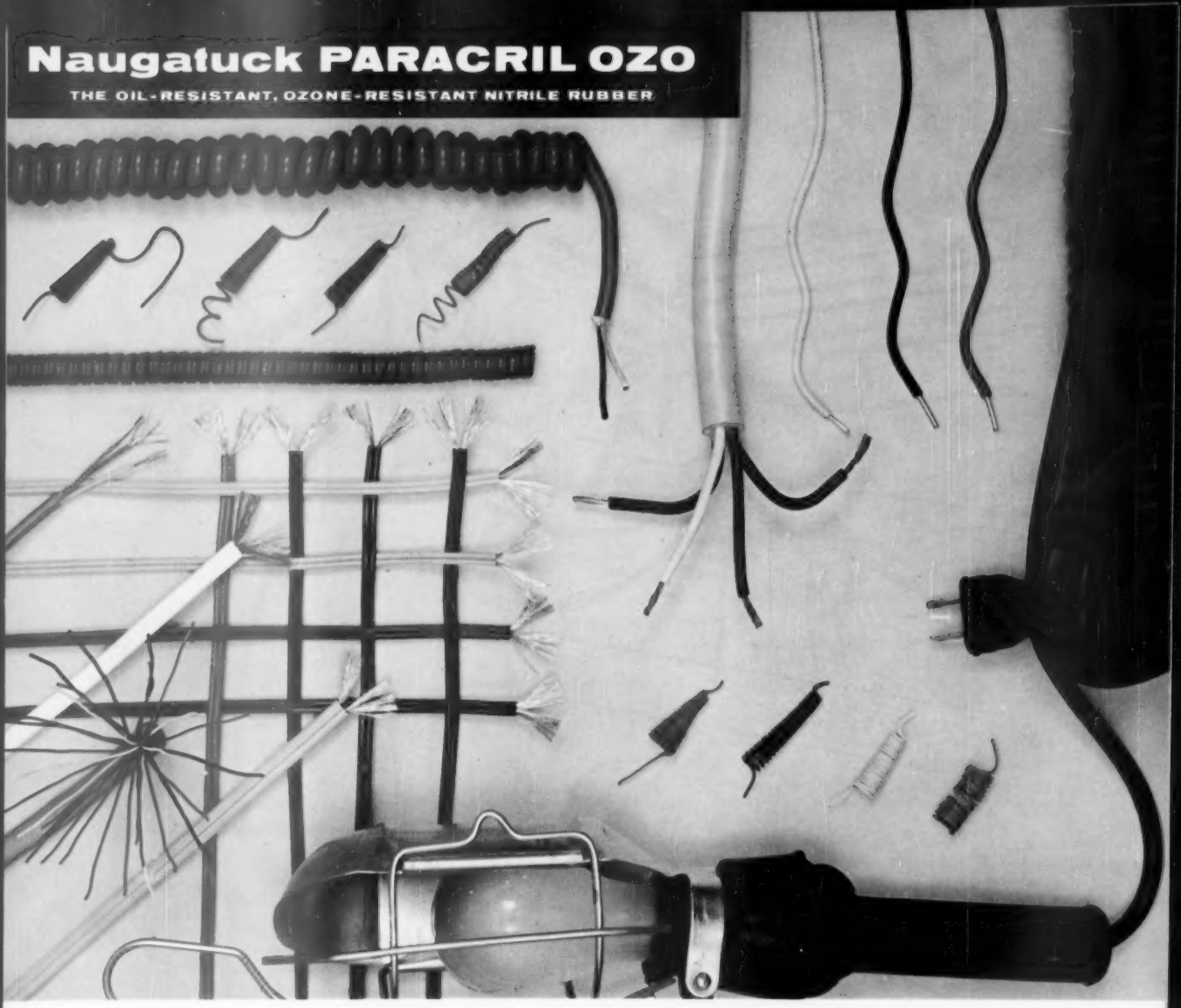

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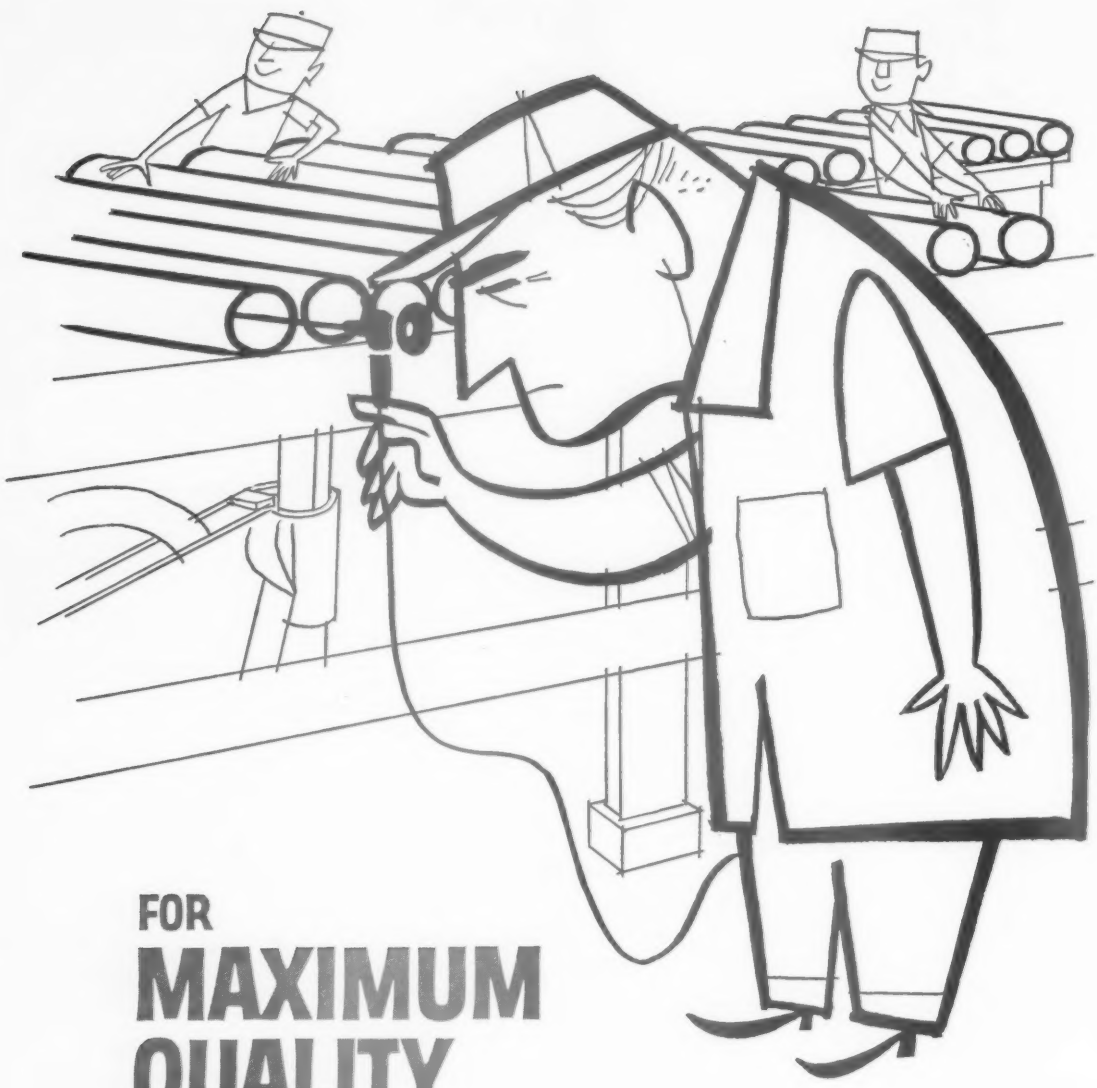

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the Journal said...

50 years ago

April 6, 1910

Arkansas section of Standard Oil Co.'s new pipeline from Oklahoma to Baton Rouge is completed and tied into Oklahoma section, now being completed, and Louisiana section recently placed in operation. Whole line to be in operation later this month.

Indifference of many members about paying their dues leads to dissolution of Mid-Continent Oil and Gas Producers Association and reorganization by Oklahoma oil men of Oklahoma Oil and Gas Producers Association. E. R. Perry, Tulsa, is elected first president.

California oil group organizes Arizona Pipe Line Co. with plans to lay a fuel-oil pipeline from Bakersfield across Tehachapi Mountains to Arizona with terminus initially at Phoenix. Proposed line designed to eliminate 600 to 900-mile tank-car haul serving Arizona's mining camps and smelters with daily consumption of 10,000 bbl.

25 years ago

April 11, 1935

Doubts concerning the ability of Oklahoma's new Edmond field, north of Oklahoma City, to produce in large quantities were removed last week when Mid-Continent Petroleum Corp.'s 2 Young came in flowing 1,150 bbl. of oil the first hour from 116 ft. of Wilcox sand at 6,694 ft.

Gov. James V. Allred, of Texas, asks legislature to create public agency to provide and operate state-owned pipeline and natural-gasoline plants to handle gas production in the expansive Panhandle region. Proposed line to be laid possibly to St. Louis and Detroit at estimated cost of $60,000,000.

Dr. Walter M. W. Splawn, federal trade commissioner, proposes federal control of wholesale price of natural gas transported in interstate commerce.

10 years ago

April 13, 1950

Strikes by members of the Oil Workers International Union close five of The Texas Co.'s major refineries, located at Casper Wyo.; Port Arthur and Port Neches, Tex.; and Lawrenceville and Lockport, Ill. More than 7,000 workers affected.

World's first quadruple reactor Houdriflow cracking unit goes into operation at Sun Oil Co.'s Toledo refinery, now doubled in size in $22,500,000 building program. First commercial production of synthetic benzene from petroleum begins at Pan American Petroleum Corp.'s Texas City refinery.

JOURNALLY SPEAKING

The Oil of HOPE

IN A RECENT magazine we skimmed lightly through the review of a book on corporations by a New Dealish professor and noted that he criticized big companies for making donations to education and charity when their duty was to provide dividends for their stockholders.

We seemed to recall that some 25 years ago this same professor was among the starry-eyed young reformers who wanted to bust up big business, have everything run by the Government, and practically outlaw the profits system.

Well, we reflected, at least the guy has mellowed enough so that he now defends the profits system, and the most damning thing he can think of to say against big corporations is that they are too generous and charitable and don't pay high enough dividends.

But what's wrong with corporation officials giving away a little of the profits to legitimate and worthy causes? We can't recall ever hearing of stockholders complaining of the practice. In fact, most of them seem rather proud of the fact that their companies have a social conscience.

Nor can we find anything antisocial in it. In these days of high personal taxes, and when most business is conducted under the corporate form, few individuals are able to make really large contributions. Since most of our citizens' money is in the custody of corporations it seems altogether fitting and proper for the hired managers to supervise the charitable distribution of a tiny portion of it.

If not, what will happen to private colleges, community chests, and other worthy causes? Should the Government take them over, too? Perhaps that is the deep, subversive aim of the critics of corporate charity. But for our part, we would rather have company executives give away a little of our money then have politicians give away a lot of our taxes.

Such ruminations were prompted by reading about an experiment in international relations being launched with the aid of some relatively modest contributions by a dozen or so large oil companies together with much larger contributions from other industries and many individuals.

This is Project HOPE, standing for "Health Opportunity for People Everywhere," conceived and sponsored by a purely private organization known as the People-to-People Health Foundation. Its idea is to send doctors and health technicians to underdeveloped countries in need of medical assistance, particularly in times of epidemic or disaster.

The project is well under way. The U. S. Navy has loaned a mothballed hospital ship which is now being reconditioned. Food, drug, and hospital-supply companies are completely stocking the ship for a year's expedition. Scores of dedicated doctors, nurses, and other public-health specialists have volunteered to serve. The government of Indonesia has invited the ship to spend a year in its country.

Then came the question of fuel. The mere suggestion was enough to bring donations from a few big oil corporations sufficient to fuel the ship for a whole year.

Now funds are being solicited from individuals to cover miscellaneous expenses of the experiment, and we understand the money is coming in rapidly because the project sounds so worthy and so rational. The ship will go only where invited, and its purpose will be education and emergency relief rather than sustained charity. Its staff will cooperate with, rather than compete with, local doctors and public-health officials in building clinics and sanitation projects and in teaching the use of advanced medical practices and equipment.

Some enthusiasts think that the project will be so well received that before long the single ship will grow into a "great white fleet" of medical-school ships, all privately financed, and that this will do more to improve international good will and the understanding of the American way of life than all the foreign-aid projects the Government is financing out of our tax money.

The oil industry won't get any credit for its small part in Project HOPE, nor is it seeking any. And it doesn't get much public credit for its many other contributions to education and other worthy causes. It's just trying to be a good citizen.

—Henry D. Ralph.

Several thousand success stories speak for Baker Retrievable Bridge Plugs and the men who run them...

PRODUCT NO. 677-C

Why a retrievable bridge plug in the first place? The reason was a compelling one – there was a need to save time and money on certain important operations *(see right)*.

So a few years ago, Baker developed a new kind of bridge plug. Today, several thousand successful jobs later, Baker Retrievable Bridge Plugs have proved themselves to the satisfaction of operators the world over.

There's a reason for this success. Baker engineers have just one business – and that is designing oilwell tools. Likewise, Baker Servicemen have but one business – and that is running Baker tools. These are the things Baker concentrates on.

Superior tools and professional tool specialists to run them – it's a hard combination to beat. That is why so many operators look to Baker for tools and service.

The Facts About Baker Retrievable Bridge Plugs

WHY RETRIEVABLE BRIDGE PLUGS?

Baker designed them to fill a need for bridge plugs that could be set or reset any number of times without coming out of the hole. Without retrievable plugs, drill-up time alone would be a formidable cost factor in certain operations *(see below)*.

HOW THEY WORK

1 A Baker Retrievable Bridge Plug is run in on the Baker Full Bore Cementer – or by itself on wire line or tubing. Large bypass valves let it run freely.

2 Operation is simple and positive. Once in the hole and released, it sets and packs off automatically – no rotation is required.

3 Packoff is dependable. Two packing cups and two opposed sets of rocker slips hold pressure from either direction. When pressure differential reverses, the packoff reverses automatically.

WHERE AND HOW THEY ARE USED

1 They do many jobs. They see the most action in fracturing, acidizing, and squeeze cementing operations where they are teamed with the Baker Full Bore Cementer.

2 These are the bridge plugs that made conventional straddle tools obsolete. A Baker Retrievable Bridge Plug and a Full Bore Cementer can straddle virtually unlimited distance.

3 Because these plugs are so easy to pick up and relocate, any number of zones can be tested and treated in one round trip.

4 They are also used alone wherever a temporary plug is required down-hole.

5 They are used to plug off just below surface to keep the well under control when working over or testing well head equipment.

6 They are kept available as emergency equipment for offshore wells.

ARE BAKER PLUGS SUPERIOR?

For one thing, Baker Retrievable Bridge Plugs have two sets of opposed rocker type slips. In Baker's opinion, a retrievable bridge plug needs this extra holding power. Moreover, the plug is self-setting. Setting requires neither rotation nor pulling. Note this, too: the bypass valves have no ports or slots to plug up with mud, sand, or junk. They are full-opening 360° valves. These bridge plugs are simple in design, and are simple to operate. That is why they adapt with easy flexibility to the performance of many important operations.

BAKER

RETRIEVABLE BRIDGE PLUGS

BAKER OIL TOOLS, INC.
HOUSTON
LOS ANGELES
NEW YORK

Is market demand an unknown quantity?

A FOREIGN OIL MAN inquires how the various states in this country determine the demand for their crude each month.

That's a good question.

The answer is that only half a dozen even pretend to try. And their record over the years reveals frequent wide discrepancies between their estimates and actual market demand.

STATE CONSERVATION BODIES have three sources of information on demand: Bureau of Mines forecasts, nominations by crude buyers, and miscellaneous information that may come to their attention.

The B. of M. annual over-all forecast is quite good, but its monthly breakdown by states is frequently wide of the mark. It appears arbitrary, and lacking in short-range seasonal and regional factors.

Nominations by crude purchasers theoretically should give an excellent forecast of the demand for a given state's crude during the coming month. But these nominations very often are far off from what actual demand turns out to be.

One fault is that buyers use different methods for nominating. A few may nominate on a pattern they consider best for the state or the industry as a whole. More request a producing pattern that will give them maximum take from their own connections and require minimum spot buying from others. A few such frankly admit making self-interest nominations and leave it up to the commission to determine the real market demand.

Another complication is the increasing number of independent crude buyers who have no refineries but who gather and resell to others. At times their nominations duplicate those of their refiner customers.

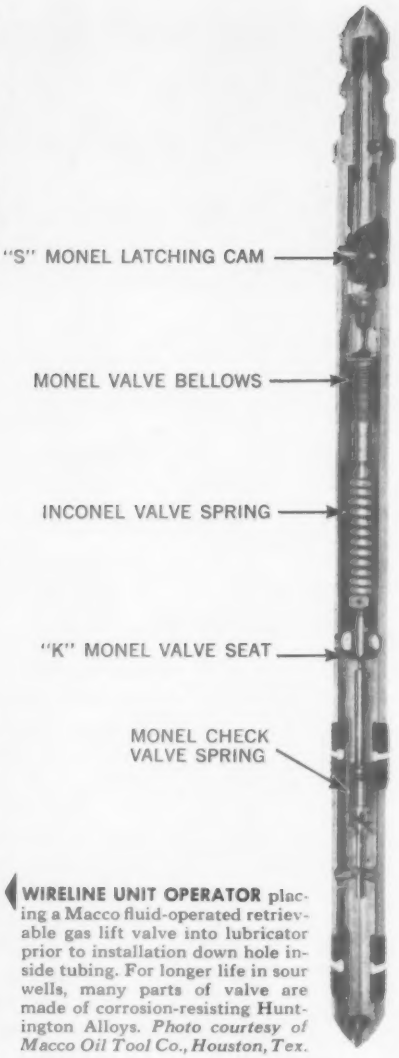
Furthermore, an integrated company's nomination is often influenced more by what its producing department would like to produce than by the market forecasts of its economic analysts.

As against factors tending to inflate nominations, buyers customarily take much more than they nominate if allowables are set high, thus inviting the inference that their nominations were unrealistically low.

BETTER BALANCING of supply with demand is one of the most important problems facing the U. S. oil industry. The truth seems to be that neither crude purchasers, producers, nor commissions are making full use of the various sources of demand forecasts and market data that are available.

Perhaps the states should lay down specifications and definitions that would make nominations a better guide to demand. Perhaps their demand hearings should be broadened to include more comprehensive and objective analyses of consumption and inventory trends.

At any rate it is obvious that the nation as a whole is doing a poor job of keeping crude supply in line with demand for refined products. We need either better forecasts or better use of those we have.



WIRELINE UNIT OPERATOR placing a Macco fluid-operated retrievable gas lift valve into lubricator prior to installation down hole inside tubing. For longer life in sour wells, many parts of valve are made of corrosion-resisting Huntington Alloys. *Photo courtesy of Macco Oil Tool Co., Houston, Tex.*

Nickel alloys help lift more sour crude with less effort

Only a minimum amount of gas is needed when the critical parts of the gas lift valve are made of dependable Huntington alloys. Once crude petroleum is raised to the tube level of the valve, it stays raised. There is no backflow to the well bottom, due to frequent valve leaks. The unique combination of useful properties offered by Huntington alloys help to maintain critical tolerances and high valve efficiency.

Ten years ago, a string of Macco fluid-operated gas lift valves was installed in a sour West Texas well. Despite the high concentrations of salt water and hydrogen sulfide encountered, the valves are still in excellent condition today.

Credit this to the wise and liberal use of corrosion-resisting nickel alloys – in Macco gas lift valves! Metals like Monel* nickel-copper alloy for the bellows and one of the springs . . . Inconel* nickel-chromium alloy for another spring . . . "S" Monel* hard-grade nickel-copper alloy for the latching cam . . . and "K" Monel* age-hardenable nickel-copper alloy for the instrument's valve seat.

Every one of these Huntington Alloys is corrosion-resisting and combines great strength with resistance to temperature extremes, and to abrasion, shock and wear. Each alloy has specific *extra* properties that fit it particularly well for certain jobs: "K" Monel alloy, for example, is non-magnetic and can be heat treated to develop exceptionally high tensile strength and hardness.

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Kansas Is Ripe for New Oil Laws

• More and more oil men in Kansas will tell you the state's conservation laws need an overhaul. And state officials are inclined to go along with this philosophy. This combination could lead to some changes which will give the oil business a better shake in Kansas.

Robert J. Enright
District Editor

OPERATORS in Kansas now have a great opportunity to untangle a confused crosspatch of laws, rules, and administrative procedures governing the oil industry in that state.

The Kansas Corporation Commission has recognized publicly that the state's oil and gas conservation rules are greatly "in need of revision and republication."

Furthermore, Gov. George Docking has shown genuine interest in his state's petroleum problems and a keen appreciation of advancing industry technology. Many producers feel he can be counted on to help in any earnest drive by the industry to ease its economic ills in the legislature.

Under its own volition, the commission has set up an industry advisory committee and charged it with recommending changes needed to refine and update its rules. The committee has held two preliminary meetings.

A Journal study shows most operators are wholeheartedly applauding the commission's action. They agree that broad rewriting and consolidation of the rules is badly needed. Continued addition of rules over the years has led to a situation where several widely separated sections may deal with just one production function. This makes it difficult for an operator to know for sure whether he has conformed.

Likewise, much confusion stems from the fact that commission actions sometimes are based on sections of statutes which do not have counterparts in the rules—or on administrative policies which cannot be found in either statutes or rules.

1. Statutes at fault

Nearly all operators contacted agreed that revising and rewriting rules—though much needed and desired—would not get to the roots of Kansas' basic regulatory ailments.

They contend the major bugs in the Jayhawk system are to be found in its statutes.

In some cases, statutes now on the books are ill-advised. In others, the lack of any law at all is causing trouble.

Major criticisms are directed at statutes which in effect tend to take away the commission's proration function after other laws have given it this power.

There is a law, for instance, which prohibits the commission, with certain exceptions, from cutting the allowable of a Kansas well below 25 bbl. a day if it can produce this much. This law effectively isolates most of the wells in the state from allowable ups and downs. And the entire burden of a state allowable cut during a period of depressed demand must be borne solely by remaining wells which by virtue primarily of depth have earned higher allowables.

This has at points within the past year reached "the utterly ridiculous extreme," as one company puts it, "where no well in the state, regardless of depth, acreage, or productivity, was allowed to produce more than 25 bbl. a day!"

Under present law, operators contend, there is nothing the commission can do about this situation. Its hands are tied.

Furthermore, Kansas has no statewide spacing law, no compulsory pooling for drilling, no compulsory fieldwide unitization.

There are many cases, operators

What's Wrong in Kansas

THERE IS a pressing need for a wholesale revamping of oil laws and regulations in the Jayhawk state.

Trying to progress within a framework of bad law in some cases, no law in others, the Kansas Corporation Commission has sewed patch after patch onto the state's conservation framework. And the whole much resembles a confused crazy quilt.

The result?

- Good wells are penalized by an allowable policy which over-subsidizes poor wells.
- The incentive to cut costs by drilling fewer wells is missing. Current practice discourages wide spacing and rewards the operator for drilling wells close.

Kansas is not the only state facing such problems. The Journal has pushed steadily for reform in Oklahoma. The need for modernizing laws and regulations in Texas and Louisiana was pointed out in two recent Journal articles (Jan. 18, p. 41 and Jan. 25, p. 124).

This is the first of a two-part study on what's wrong in Kansas.

How Kansas Sets Deep-Well Allowables

THE KANSAS Corporation Commission has adopted a depth-factor formula to compensate the operator drilling deep wells in the state.

The formula applies to all Class B pools, those with an average per-well production of 25 bbl. a day or more. The formula is equitable as long as the demand for Kansas oil remains high. But once the allowable is cut, the loss is sustained by these deeper wells.

The depth-factor formula, adopted in 1953, is one of several administrative moves made by the commission in an effort to encourage deep drilling and wider spacing.

Depth	Proportionate Factor	Min. Allow. Bbl./Well Daily
0-4,500	1.00	25
4,000-4,500	1.24	31
4,500-5,000	1.48	37
5,000-5,500	1.72	43
5,500-6,000	1.92	48
6,000-6,500	2.08	52
6,500-7,000	2.24	56
7,000 or deeper	2.40	60

say, where unscrupulous oil men have drilled within one foot of their lease line. They have habitually and legally upset bonafide efforts at wider spacing by jumping in and drilling before field rules could be established.

Thus, operator efforts to cut costs via wider spacing are discouraged not only by inadequate allowable incentives but also due to the frequent necessity of having to do expensive infill or protective drilling—more of it than if they had drilled on 10 acres to start.

Many millions of dollars in Kansas are now going into wells not needed to produce the oil. And this, many operators contend, is at the expense of exploration there.

2. Allocation setup faulty

Some operators are convinced that Kansas' present allocation system eventually will run many companies out of the state if it is not changed.

They point to a national trend wherein operators are forced to drill ever deeper to find substantial oil and gas reserves. Costs skyrocket with depth. But it is the deep wells which the Kansas allocation system penalizes most when allowables are cut.

The same is true of the relatively few pools which have been granted allowable over 25 bbl. for spacing wider than 10 acres. When demand is tight, they are the first to be cut.

How it works . . . Kansas oil pools are grouped in three classes. They are classed as B, C, or D pools according to average well productivity in the field.

Class B pools are those with average well productivities of 25 bbl. daily or more. Wells in these fields are prorated on an individual well basis.

Class C pools are those with average well productivity between 15 and 25 bbl. a day. Class D fields are fields which formerly were exempt from proration, most of them in the stripper areas of southeastern Kansas. Average well productivity in these pools is 15 bbl. daily or less.

Wells in class C and D pools, unlike those in the B pools, are prorated on a lease basis rather than per well. This is another objectionable facet of the system to many operators. A producer with a lease allowable can produce that allowable any way he wishes—even going so far as to shut in most of the wells on the lease and produce one or two of the best.

The minimum daily allowable for a lease in a Class C pool is 20 bbl. times the number of wells on the lease. Class D leases get 15 bbl. times the number of wells on the lease.

This portion of the Kansas market is toted up and set aside when the commission sets the monthly state-wide allowable. Whatever is left is then distributed among the wells in the Class B pools—the state's best.

The Class B mess . . . Most operators can follow the allowable-setting process up to this point even if they don't approve of it. But from here on, some are sincerely perplexed as to how the commission arrives at per well allowables for Class B wells.

The only method set out in the statutes for fixing allowables for prorated pools (adopted in 1939) employs a log-log curve to get a percentage factor which is applied to average well-productivity of a pool to get the allowable.

The workings of the 25-bbl.-minimum law together with tightened demand, however, rendered this virtually useless. The percenetage factors were adjusted to the point where the allowable was roughly 25 bbl. whether the productivity was the maximum 3,000 bbl. daily or the minimum 25.

Though still carried as a matter of routine in the monthly proration order, the log-log curve factor system is no longer used to fix allowables.

In its place, the commission worked up a depth allowable factor system which grants added allowable for each 500-ft. increment below 4,000 ft. down to a lower limit of 7,000 ft. Allowable for a well between 4,000 and 4,500 ft. under this system is 31 bbl. daily. That for a well 7,000 ft. or deeper is 60 bbl.

The depth-factor system was incorporated in the rules in 1953. It is not found in the statutes.

The commission has adopted other administrative allowable-setting policies. One such, first used last year, grants credit for well depth at a rate of 1 bbl. per 100 ft. of depth to top of pay if the well is located in a 40-acre spaced pool and within a specified distance of the center of a square 40-acre tract. This policy appears neither in rules or the statutes.

Still different treatment is given administratively to the few 80-acre spaced pools in the state. Allowables in these pools range upward from 65 bbl. and are fixed arbitrarily. Most operators are completely fogged as to what determines how big an 80-acre allowable will be.

Adding to the confusion is a provision in the statute that says in effect that a 20-acre well may earn twice the allowable of the 10-acre well—and a well with between 30 and 40 acres attributed may earn three times the 10-acre allowable. This has apparently gone by the boards, though it is still in the statutes.

There are still other statutes which adjust allowables on the basis of acreage. One such adjusts acreage

New IOCC Study Near

THE Interstate Oil Compact Commission is about to take a serious look at ways to prevent physical waste and the allocation methods of member states.

A brand new committee set up to study physical waste and allocation methods will hold its first meeting April 26 in Cheyenne, Wyo. Gov. Joe J. Hickey of Wyoming and E. J. David, Jr., of Oklahoma, are co-chairmen of the committee. The study was approved by the IOCC executive committee in February.

Other committee members are Gen. E. O. Thompson, chairman of the Texas Railroad Commission; Warwick M. Downing, chairman of the Colorado conservation commission; A. L. Porter, Jr., of New Mexico; and C. R. Henderson of Utah.

which can be attributed to an oil well according to how close it is to a lease line—the closer to the line, the smaller the allowable. It applies to the smattering of "spaced" pools in the state and may also be applied when a well is drilled on less than ten acres.

Economic waste hit . . . The myriad of statutes, rules, and administrative poilcies—some of them in use, some not—that affect allowable setting in Kansas make it extremely difficult for anyone other than a dedicated student of the system to understand it.

To top it off, any allowable granted a well in excess of 25 bbl. daily by virtue of wider spacing or depth is wiped out when demand for Kansas oil is very low.

The net effect is to make it imprudent for an operator to drill on wide spacing even though he could recover the same oil with fewer wells at much less cost. He is economically forced to drill on 10 acres in most cases just to get allowable.

As one operator puts it: "We know, when the Kansas allowable is cut, that the 40-acre wells will have to absorb it. So why drill on 40's?"

It is much safer, this company contends, to space on the 10's. "Then you are assured an allowable of 100 bbl. a day from a 40-acre tract, whereas your 40-acre tract is quite likely to get cut to only 25 bbl. a day if you drill just one well."

3. What to do?

Most operators contacted by the Journal feel that the major block to an efficient allocation system which would treat all wells fairly and encourage rather than discourage exploration is the statutory 25-bbl. minimum.

Such a high allowable floor, most think, is completely unrealistic. The stripper well doesn't need this much allowable to make a reasonable profit.

"It would be a bad law under any period," one large producer argues, "and, under present conditions of limited demand for Kansas oil, it will render any reasonable allocation system utterly unworkable."

Many of the smaller independents in the state have voiced opposition in the past to any tampering with the 25-bbl. per well minimum. Such operators confine the bulk of their operations to the shallower stripper areas in the state. And they have felt such a law works to their advantage.

Depth plus acreage . . . The Journal survey found nearly all larger operators contacted ardently in favor of a new yardstick type of allocation for Kansas taking into account both depth and acreage.

And the acreage factor, they feel, should be sufficiently large to remove any incentive for drilling on close spacing merely for allowable advantage.

Operator A suggests a simple yardstick with just two columns—one for depth range; the other setting out a barrel-per-acre allowable for that depth. Thus, a well between 0 and 2,000 ft. might be given 1 bbl. of allowable per each acre on his tract. A 2,000-3,000 ft. well might earn 1.15 bbl. per acre. And so on.

Such a system would not prohibit an operator from drilling on a couple of acres—but his allowable would be too small to economically justify it.

A producer, Operator A says, could glance at such a yardstick and quickly determine what allowable he would get, for instance, for a 5,000 ft. well on 80 acres.

The commission could compensate for fluctuating demand by raising or lowering the per-acre factors while retaining the same relative proportions. This is somewhat like the system now used by the New Mexico conservation commission in setting the state's allowable.

Marginal properties under such a setup, it suggests, could be taken care of via hardship-hearing procedures.

Operator B says: "We favor doing away with the 25-bbl. minimum, junking the present patchwork allocation setup, and adopting a depth-acreage formula—with emphasis on acreage."

Operator C continues the refrain with: "We would like to see an acreage-depth yardstick put into effect. We feel a realistic acreage factor in the formula would encourage exploration in Kansas and increase the state's reserves."

•

NEXT WEEK: The above problems dealing with allowables and allocation in Kansas are some but not all of the headaches encountered by operators there. Next week a second installment will pry into others dealing with acreage attribution, leaseline crowding, generally chaotic spacing—and what operators feel should be done to relieve them.

New Law Seen as Knockout Punch for Smog

• Exhaust devices eventually will be required on all cars in California, under provisions of the bill. However, it has a county option feature.

ALL 1961 model autos probably will have to have anti-smog exhaust control devices installed before they can be peddled in California.

This prospect results from passage last week of a state-wide auto exhaust control bill by the California legislature.

S. Smith Griswold, director of the Los Angeles County Air Pollution Control Board, predicts the new measure will spell the end of smog in Southern California within 5 to 6 years.

Although no deadline was set, the mechanics of the bill point to 1961 as being about as soon as devices could be tested and certified for use by a special 13-member board.

The bill calls for installation of exhaust control devices on all new cars sold in the state within 1 year after at least two such devices have proven effective.

Actually, the bill calls for exhaust devices on all vehicles, new or used, eventually. The one exception is that counties have the option of exempting used vehicles in areas where smog has never been a problem.

The bill also:

. . . Provides $500,000 to be used by the 13-member board in testing devices, either in public agencies or private research laboratories.

. . . Requires devices on used cars when title is transferred in the first year, on all used commercial vehicles in the second year, and on all motor vehicles in the third year.

The bill goes to the governor for his signature and becomes law 90 days after adjournment of the legislature, which was expected by the end of last week.

Here's a Rundown on 35 Oil Companies'

Rank by Assets	Assets 1959	Assets 1958	Net Profit 1959	Net Profit 1958	Per Share Profit 1959	Per Share Profit 1958	Crude Prod. (bbl. daily) 1959
1. Jersey Standard	$8,289,453,099	$7,946,127,000	$629,777,523	$562,475,000	$2.93	$2.72	2,464,000
2. Gulf Oil Corp.	3,576,317,948	3,430,019,200	290,466,758	329,533,066	2.90	3.29	1,304,183
3. Texaco	3,347,742,745	3,172,773,683	354,346,323	311,154,995	5.85	5.24	1,221,537
4. Socony Mobil	3,347,398,672	3,237,327,528	164,952,000	156,785,712	3.38	3.24	749,000
5. Standard (Ind.)	2,846,501,970	2,769,317,364	139,597,429	117,775,022	3.90	3.29	307,686
6. Standard (Calif.)	2,578,295,796	2,451,069,401	253,599,061	257,758,819	4.01	4.08	884,010
7. Shell	1,767,308,872	1,648,270,721	147,417,592	128,582,792	2.43	2.12	366,000
8. Phillips	1,579,935,372	1,515,497,840	104,639,393	84,236,994	3.05	2.45	220,100
9. Sinclair	1,494,068,815	1,499,900,555	45,526,380	49,472,613	2.96	3.23	177,359
10. Cities Service	1,294,661,179	1,286,374,582	42,434,080	38,300,000	3.95	3.57	137,866
11. Tidewater	856,413,000	810,731,000	33,941,000	2,616,000	2.23	(.03)	113,376
12. Atlantic Refining	807,813,193	776,625,594	30,173,945	36,129,961	3.19	3.86	137,699
13. Continental	787,708,488	650,652,037	60,272,000	48,394,000	2.85	2.40	178,639
14. Sun Oil	739,218,978	666,927,366	42,844,225	32,060,719	3.48	2.73	129,408
15. Sunray Mid-Cont.	582,284,120	540,775,311	43,814,599	40,663,623	2.25	2.14	86,131
16. Pure Oil Co.	552,907,212	533,287,120	28,904,604	28,821,730	3.32	3.35	65,635
17. British Amer., Ltd.	522,884,404	511,652,153	25,601,649	20,517,935	1.25	1.00	60,548
18. Ohio Oil Co.	462,526,744	400,243,054	38,632,887	32,155,558	2.76	2.45	109,298
19. Union Oil Co.	451,985,630	425,895,812	27,515,409	24,998,695	3.22	2.93	91,877
20. Richfield	422,324,640	410,749,699	28,058,104	20,093,617	6.95	5.02	72,164
21. Skelly	394,311,243	380,080,240	27,992,203	27,686,553	4.87	4.81	64,465
22. Standard (Ohio)	336,651,351	334,446,701	25,060,769	24,044,463	5.02	4.82	38,941
23. Amerada	185,809,887	172,564,768	24,022,835	22,485,135	3.81	3.56	82,478
24. Standard (Ky.)	141,850,667	133,822,755	14,725,667	14,053,527	5.65	5.40	
25. Champlin	121,327,822	119,900,627	8,547,890	7,308,706	2.00	1.70	14,246
26. Honolulu	97,728,000	91,537,000	12,894,387	11,845,331	3.44	3.16	43,300
27. American Petrofina	97,069,914	96,798,425	1,015,746	126,459			9,312
28. Anderson-Prichard	96,416,264	88,766,578	6,884,592	3,846,094	3.90	2.08	14,175
29. Plymouth Oil	85,106,507	88,477,270	2,185,743	4,588,312	.84	1.79	14,986
30. Texas Pacific	78,702,085	74,927,633	7,196,561	6,231,481	1.85	1.67	20,139
31. Delhi-Taylor	71,524,400	78,339,725	2,706,698	(1,601,728)	.51	(.30)	5,945
32. Texas Gulf Prod.	53,880,683	52,596,977	4,188,853	3,972,955	1.04	.98	13,800
33. Louisiana Land	47,823,387		19,365,839	17,367,203	2.16	1.94	26,004
34. Barber Oil Corp.	46,620,587	49,279,275	(1,557,174)	(160,893)			
35. Clark Oil & Ref.	35,176,685	31,707,637	2,126,994	1,422,978	1.39	.93	

Economy Drives Made '59 a Good Year

ANNUAL reports now coming from the presses write off 1959 as a year of moderate profit gains for oil companies.

And the industry was lucky to mark up the moderate increases. In fact, the gains speak well for stringent economy programs instituted by most oil managements the year before. The profits managed to survive persistent industry problems of soft prices, crude and product oversupply, and rising costs.

Most of the leading oil firms showed profit increases ranging from modest to substantial.

Only five—Gulf, California Standard, Sinclair, Atlantic Refining, and Plymouth—recorded a decline in profits.

Unusual profit gains were shown by Tidewater, American Petrofina, and Delhi-Taylor.

Composite earnings of the oil industry, however, were not as good as those of U. S. manufacturing corporations generally. The First National City Bank of New York reported that the average earnings of 1,383 manufacturers in 1959 was 27% greater than in 1958. The average earnings of 97 oil companies, meanwhile, were only 14% more.

Another study, made by the Federal Trade Commission and the Securities & Exchange Commission, showed after-tax profits of the refining industry were up only 6.4%. This gain would have been higher except for a very poor fourth-quarter, when profits dropped 11.9% below the fourth quarter 1958.

Except for the price weakness, 1959 might have been one of the oil industry's banner years. Nearly every company reported new highs in production, processing, and sales. The heavy volume went far toward offsetting narrower profit margins.

The outlook . . . The companies also still have an optimistic view of the oil industry's future.

Sinclair's Chairman P. C. Spencer took issue with those who rate petroleum as no longer a growth industry. He said oil is one of the most basic and resilient industries and is woven into the nation's economic fabric. It has dynamic potentials solidly based on a continuously rising per-capita consumption of energy at home and abroad.

Indiana Standard Chairman Frank O. Prior and President John E. Swearingen predicted that both world and domestic consumption should show

Operations in 1959, Compared With 1958

Crude Prod. (bbl. daily)	Gas Production (M.c.f. daily)		Refinery Runs (bbl. daily)		Wells Drilled				Employes		Rank by Assets
					Producing		Dry				
1958	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958	
2,329,000	1,526,000		2,789,000	2,489,000		981			146,000	154,000	1
1,262,635	952,357	874,080	685,101	698,133	2,205	2,636			50,700	56,000	2
1,100,726			1,219,034	1,124,680	1,299	1,301	243	239	53,510	54,108	3
722,847	1,046,000	976,000	939,000	869,805	421	387	115	100	73,600	75,000	4
285,474	1,509,343	1,347,590	598,280	640,648	644	489	193	201	43,569	46,033	5
854,892			788,400	781,732	470	537	144	109	38,390	38,395	6
347,000			489,753	463,778	815	733	238	217	38,217	38,572	7
208,600	2,798,919	2,606,872	227,000	218,332	433	226	55	45	24,575	24,459	8
187,408			441,718	428,748	243	200	101	77	23,557	23,828	9
129,480	867,950	804,345	280,002	251,784	539	421		103			10
100,581			227,000	213,000	522	306	118	70	9,361	9,459	11
119,298			194,413	186,703	224	204	64	63	15,394	16,247	12
151,100	441,300	385,600	180,867	166,482	495	336	121	82		9,826	13
109,732			232,356	227,249	270	313	160	158	17,292	17,521	14
80,435	375,334	381,467	154,026	103,099	170	183	79	78	5,894	5,599	15
59,535	292,961	284,341	166,355	164,633	159	77	60	45	10,740	10,981	16
60,164	161,644	93,151	124,932	414,121	182	190	147	138	7,450	7,660	17
100,681	301,305	288,496	100,268	41,425	297	301	108	91	7,534	6,453	18
93,088	288,032	253,460	172,682	164,518	130	114	80	69	7,332	7,442	19
62,033			137,814	119,044	98	53			6,374	6,260	20
64,076	346,785	331,548	48,882	48,971	266	317	89	86	4,787	4,817	21
35,307	87,000	86,000	138,986	128,119	85	93	77	48	10,690	11,138	22
79,870					161	212	86	112			23
											24
13,962	286,117	299,708	27,064	25,124	65.24	60.54	39.58	20.51		1,507	25
36,700	71,832	68,493			134	88	38	23	730	667	26
9,342	42,233	38,342	39,173	38,241							27
13,001	39,161	39,959	30,074	30,228	54	52	27	21			28
15,710	88,035	82,823	31,959	25,770	20	79	18	10	927	938	29
18,504	40,053	36,307			104	49	21	19	449	474	30
5,801		68,493	41,000	29,439	46	28	11	10	681	659	31
14,250	32,707	35,710									32
20,611	53,853	42,434			140	147	30	43			33
											34
			30,408	29,171					2,880	2,500	35

in Spite of Problems

tremendous volume increases in this decade. They foresaw a 3 to 4% increase this year.

Texaco's Chairman Augustus C. Long and President James W. Foley predicted a 4% increase this year in domestic demand with an 8% increase in the rest of the free world. They observed the industry seems to be moving toward a sounder inventory position and increased consumption should make 1960 another good year.

Socony Mobil's President Albert L. Nickerson revealed his company is betting heavily on the oil industry with expanded exploration and development drilling programs in the Gulf of Mexico and North Africa and new investments in petrochemicals. Its 1960 budgeted capital and exploration spending is 10% above 1959.

Jersey Standard's report, signed by Chairman Eugene Holman and President M. J. Rathbone, forecast a "dynamic decade in the oil industry." They said that demand for all types of energy throughout the free world will continue to increase strongly in the '60s and that oil and gas will share more than proportionately in filling this demand.

As for the current industry problems, the Jersey Standard executives observed: "Such periods have occurred before and are to be expected in a dynamic industry."

Some are happy . . . For at least three firms 1959 marked a spectacular comeback year from poor showings in 1958.

The trio and how they did it:

. . . Tidewater jumped profits from $2.6 million to $33.9 million in a year.

President George F. Getty II said factors in this success were record oil and gas production, improved refinery operating levels at the new Delaware refinery, and increased sales of gasoline and light fuel oils.

The production records were primarily due to an accelerated drilling program, resumption of full capacity heavy-oil production from California fee properties, and larger allowables in Louisiana, Getty said.

. . . American Petrofina showed a gain in earnings from $216,000 in 1958 to $1,016,000 in 1959 and continued successfully on its avowed program to become a major integrated company.

It added some 400 retail outlets during the year, including 160 newly constructed modern stations. They increased the outlets now marketing the Fina brand to more than 1,700 located in 13 Mid-Continent and Southwestern states.

Motor fuel sales were up 16% with more than 90% of these from controlled outlets. The company's natural-gas sales also were up 10% to 15.4 billion cubic feet while crude oil and condensate produced and sold remained about stationary.

... Delhi-Taylor probably made the happiest recovery on the list—it came from a $1.6-million loss in 1958 to a $2.7 profit in 1959.

Delhi recorded gains in crude and gas production, refinery runs, and drilling. It plans to add petrochemical processing this year and expand its marketing efforts in the southeastern states.

On the down side ... Special circumstances explain failure of the few firms to pile up higher profits last year.

Gulf, for instance, showed its second highest earnings year in history in 1958; but the $329-million profits that year included a $43-million gain stemming from the removal of currency restrictions in several countries. When this unusual circumstance is discounted, Gulf's 1959 profits of $290.4 million show up better.

Gulf reported one really newsworthy fact about its 1959 business: Domestic earnings nearly doubled those of 1958. This turn helped compensate for lower earnings in foreign operations. The domestic profit represented about 52% of the net.

Gulf's report showed gains in all major activities except in domestic refinery runs. They were off about 9% due to industry oversupply and a strike early in the year at Port Arthur, Tex. Gulf's foreign refineries showed a 13% gain in runs.

Gulf is off to a big start in 1960, President W. K. Whiteford said in a separate first-quarter report. Earnings are up 20% over the first quarter of 1959, exceeding $80 million. Major factor in this showing is all-time high crude-production rates in both the U. S. and Kuwait.

Gulf's U. S. production the first 2 months of the year averaged 352,935 bbl. daily while Kuwait output averaged 790,579 bbl. daily. Production at these levels is expected to continue.

Earnings held back ... Profits of California Standard slipped $4.16 million in 1959.

This was due mainly to a decision of certain company affiliates to retain part of their earnings for reinvestment in their business. The parent company does not show earnings of affiliates until they are paid to the company as dividends.

California Standard operations actually reached new highs in several divisions, particularly in reserves of crude, natural-gas liquids, and natural gas and in sales of chemicals.

Sinclair Board Chairman P. C. Spencer attributed his company's $3.9-million slide in profits in part to government restrictions on crude imports. This forced Sinclair to shut in a substantial part of its own crude production in Venezuela, which handicapped Sinclair more than its competitors.

Spencer observed, however, that the principal reason for lower company earnings was the industry's "economic discontent" stemming from depressed prices due to a burdensome oversupply of refined products.

Credits drop ... Atlantic Refining's $6-million drop in earnings was caused by a decline in special credits from sale of its Eastern Hemisphere marketing subsidiaries.

On an operating basis, profits were 23% better than in 1958.

Atlantic President Henderson Supplee, Jr., reported highlight of the year was the gain made toward a goal of self-sufficiency of crude supply. The relation of crude produced to refinery runs rose from 52% in 1955 to 71% in 1959, he said. Present restrictions on domestic production and on crude imports limit the immediate benefit from this improvement.

Troubles everywhere ... Plymouth Oil President W. S. Hallanan observed frankly that Plymouth's $2.4-million drop in earnings made 1959 a disappointing year.

Plymouth was affected not only by depressing factors common to the whole oil industry, but also by others peculiar to its own operations. For instance, while the average crude-oil price throughout the domestic industry dropped 7 cents per barrel in 1959, the most severe cuts were in fields where Plymouth's production is centered. The result was an average 10-cent cut on Plymouth's production.

Other depressing factors: Heavy cutbacks in Canadian production where Plymouth has built substantial reserves; unusually warm weather in the southeastern section of the U. S. where Plymouth's Republic division markets; unusually large charge-off for well abandonments on a drilling venture in the Ivory Coast of French West Africa.

The highlights ... The vast majority of the reporting oil companies claimed near-record operating conditions in 1959.

Report after report told of high crude production, record product sales, and especially new gains made in petrochemicals. Nearly all also commented on the depressing effects of poor prices and world oversupply.

In exploration, those companies with strikes in Libya, Alaska, Venezuela, Canada, and parts of the U. S. gave new data on the discoveries.

Ohio Oil Co., for instance, calls the Kenai Unit gas discovery in Alaska, in which it holds 50% interest, its most significant domestic discovery of the year. The Kenai well tested at the rate of 15,000 M.c.f. daily from one zone.

Ohio's Libyan operations also shed new light on prospects in the Dahra area of Concession 32. Four oil wells and three gassers were completed in the area opening up two productive zones. Productive capacities in the upper zone range from 1,200 to 8,000 bbl. daily. Potentials in the deeper zone are from 400 to 1,000 bbl. daily. Ohio says 1960 discoveries have been made in two other widely separated concessions in Libya.

Jersey Standard termed its Zelten strike in Libya the company's outstanding exploration success of the year. The discovery well tested 17,500 bbl. daily. During the year three more wells drilled in an effort to define the structure indicated the pool was a major find.

Cost problems ... Again most reports mentioned the special efforts management made during the year to increase efficiency and cut costs.

The industry for 2 years has been putting its costs through the wringer and 1959 was a big winner.

In this respect, several companies made notable gains in reducing payrolls. Jersey Standard showed a work force decline of about 8,000 during the year. Gulf's force was off 5,300 and Indiana Standard off 2,464. Many others showed only moderate staff reductions. A few showed gains, caused in some instances by mergers.

Several companies, however, acidly reported they were fighting a losing battle in cutting labor costs even with reduced staffs.

In the case of Humble, the work force declined 920 employes from 17,600 to 16,680, but total employment costs at the same time increased nearly $6 million. This was due primarily to the general wage increase given in early 1959.

Atlantic Refining's Supplee stressed that rising labor costs continue to nullify economies achieved through greater efficiency.

He gave these figures: In 10 years, average wage per employe increased 85%, but average selling price of gasoline has risen only 5%, and price of furnace oil, kerosine, and diesel fuel has risen only 14%.

Canada's New Gas-Export Permits . . .

Trans-Canada Pipe Lines
204,000 M.c.f. daily
(At Emerson, Man.)
204,000 M.c.f. daily
(At Niagara Falls)

Alberta & Southern Gas
458,750 M.c.f. daily

Canadian-Montana Pipe Line
36,000 M.c.f. daily

Westcoast Transmission
152,000 M.c.f. daily

OGJ

Cork Pulled on Canadian Gas Exports

• Export permits granted four firms will kick off pipeline, processing, and development drilling programs in Western Canada. More exports are possible, but British Columbia is a more likely source than Alberta.

The tapping of Canada's huge natural-gas reserves for export markets has moved projects costing more than $1 billion off the back burner.

Some of these plans have been simmering since 1956, and the Canadian Government's approval of four export applications will touch off these expenditures:

. . . **Some $600,000,000** for gathering and transmission systems in Canada and the U.S.

. . . **Another $250,000,000** for processing plants.

. . . **Plus $150,000,000** to develop additional gas reserves.

The export permits approve the flow of 6,529 billion cubic feet of gas from Alberta fields to the U.S. over periods ranging up to 25 years.

The four companies which hold these permits are Trans-Canada Pipe Lines, Ltd.; Alberta & Southern Gas Co., Ltd.; Westcoast Transmission Co., Ltd.; and Canadian-Montana Pipe Line Co.

A fifth applicant—Niagara Gas Transmission, Ltd.—was denied.

Pipeline revenue from the export permits granted is expected to reach $75,500,000 annually in 3 years.

Other projects costing $300 million more are expected to evolve from these export permits. The Canadian Petroleum Association has estimated that with the exports the petroleum industry will spend $6.8 billion for oil and gas development in the 10-year period ending in 1968.

The government's awards tally with the recommendations of the National Energy Board which made no major revisions in the demands of the successful applicants.

Only one export plan covered by the permits has received the necessary approval of the Federal Power Commission. That is the Trans-Canada project to deliver natural gas to Midwestern Gas Transmission Co. However, the FPC is expected to follow the action in Canada and give its approval to the projects.

Other opportunities . . . The approval of large scale exports of Alberta natural gas has initiated a chain reaction which will make the province a major producer of sulfur and liquid petroleum gases.

Pembina Pipeline Ltd., officials say a research study indicates that in 2 years a production of 92,000 bbl. of hydrocarbons a day may be expected for Alberta.

Present production is only 14,000 bbl. daily. Pembina said the additional production would be surplus and the only market for such quantities would be in the U. S.

Pembina and associated companies propose a $140,000,000 pipeline project to gather natural gas byproducts in Alberta and transmit them to the Lake Michigan area complex.

The companies estimate it would cost $40,000,000 for a 900-mile grid system to link the wet gas processing plants of 20 export fields in the foothills, extending from north of Edmonton to Waterton Lakes.

The main 1,300-mile pipeline from the Alberta border to Chicago would cost more than $100,000,000. An application for the liquid products development has been filed by Pembina with the Alberta Board of Public Utility Commissioners. Authority to export the liquid hydrocarbons also would have to be obtained from the NEB and the FPC.

James Scott, President of Pembina, said his company has formed a subsidiary—Westalta Products Pipeline Ltd.,—for the Alberta gathering system. Foothills Pipe Lines, Ltd., would own the transmission line from the Alberta border to the Great Lakes terminal.

The Canadian line would try to serve the same markets as will be supplied by Mid-America Pipeline Co., which is scheduled to be operating late this year. (See story p. 89). Southwest producers believe Mid-

How Oil Men View the Export Permits

Frank W. McMahon, President
Westcoast Transmission Co., Ltd.

"Granting of a permit to Westcoast to export southern Alberta gas to the U.S. will enable our company to begin immediately on a great industrial development program in southern Alberta and southeastern British Columbia. Development drilling, the building of gathering systems, and purification plants will result in heavy investment . . ."

C. Pennypacker Smith, Vice-Pres.
Alberta & Southern Gas Co., Ltd.

"Export of Canadian gas to California markets should begin late in 1961, if plans proceed smoothly and the FPC and California approvals are received in time to start construction this summer."

J. W. Proctor, General Manager
Canadian Petroleum Association

"The best news the industry has received in more than a year. It is very significant for the natural-gas producers who currently have idle investments of more than $250,000,000 in about 1,000 completed, but shut-in gas wells in Alberta alone."

S. W. Shambaugh, President
Canadian Association of Oilwell Drilling Contractors

"We cannot expect a sudden big boom (in drilling), but we can look for a constant increase in activity. The announcement will directly increase development in areas where there are capped wells, and this will release new funds from these wells."

James W. Kerr, President
Trans-Canada Pipe Lines, Ltd.

"The approval of these export projects by the Canadian Government will initiate activity in many areas of Canada. The incentive for substantial new activity by the gas industry has now been provided.

"Income of over $400,000,000 in American funds will be earned from (Trans-Canada's) Emerson contract alone over the life of the permit. Construction and the manufacture of equipment is to be rushed to allow export at Emerson by November 1."

America will at least delay the proposed Pembina line for some years.

Foothills is also considering the feasibility of moving sulfur in slurry form to U. S. markets. If this is not feasible, sulfur in the form of hydrogen sulfide might be piped across the border.

Permit holder's plans . . . The export projects which have been approved by Canada will funnel natural gas into three areas of the U.S.—the West Coast, Midwest, and upper New York State.

. . . Alberta & Southern, the big winner, is authorized to export a total of 3,826 billion cubic feet over a 25-year period. This is about half of the over-all total approved.

The company's exports will flow to the San Francisco area by way of 1,400-mile pipeline system at a daily rate of 458,750 M.c.f. The project cost is $337,765,000.

This permit holder is owned by Pacific Gas & Electric Co. of San Francisco. Associated with Alberta & Southern in its application were two other companies which will build some of the line. They are Alberta Natural Gas Co., Ltd., and Pacific Gas Transmission Co.

Alberta Natural is to build the British Columbia section; PGT the U. S. section, except for that part of the line in California which will be laid by PGT's parent firm, PG&E.

. . . Trans-Canada, a Canadian company already supplying Alberta gas as far east as Quebec, is authorized to export a maximum daily rate of 204,000 M.c.f. The 20-year permit covers total exports of 1,410 billion cubic feet.

These exports, which will be delivered to Midwestern Gas Transmission Co. at Emerson, Man., are the only ones which already have FPC approval.

Midwestern will lay a 504-mile 24-in. line from Emerson to Marshfield, Wis., with several laterals, to distribute these volumes. The estimated cost is $52,000,000.

"We are delighted to learn that Trans-Canada has received its export permit," Midwestern President N. W. Freeman said. "We will get our project under way promptly and hope to have it completed by early next fall. Acquisition of rights-of-way has begun."

Letting of construction contracts on the project is expected to start shortly.

Midwestern also will build compressor stations near Noyes and Staples, Minn., and 56 miles of laterals from the mainline to Fargo and Grand Forks, N.D., Dilworth and Detroit Lakes, Minn., and Eau Claire, Menomonie, and Chippewa Falls, Wis.

Michigan Wisconsin Pipe Line Co. will take the bulk of Midwestern's gas — 150,000 M.c.f. daily — at Marshfield. Michigan Wisconsin plans to build a line which will connect with the Midwestern system.

Trans-Canada is also authorized to make periodic exports to Tennessee Gas Transmission Co. at Niagara Falls, Ont., of up to 204,000 M.c.f. daily. In this case, the 20-year license period sought was chopped by 15 years. The permit expires December 31, 1965.

This year's export construction program by Trans-Canada will involve an expenditure of $39,900,000.

. . . Westcoast Transmission is permitted to export 152,000 M.c.f. daily, with the total over a 20-year period not to exceed 1,020 billion cubic feet. The amount granted is 80 billion cubic feet short of the amount requested.

The company is already exporting at Sumas, B.C., to the Pacific Northwest. It will use Alberta & Southern lines to carry the additional volumes authorized into U.S. pipelines.

. . . Canadian-Montana also plans to use Alberta & Southern lines to export to Montana up to 36,000 M.c.f. daily, or 273.7 billion cubic feet over 25 years. The parent company, Montana Power Co., will distribute the gas.

The denial . . . The applicant which was rejected, Niagara Gas, had wanted to export 73.5 billion cubic feet over 20 years to St. Lawrence Gas in New York. Both companies are subsidiaries of Consumers' Gas Co., Ltd., of Toronto.

Niagara's bid was rejected by the NEB after it determined that the price to be received for the natural gas from the importer was too low to make the company economically sound.

In the other cases, the NEB approved the prices. The average prices are: Trans-Canada, 30 cents per M.c.f.; Alberta & Southern, 27.38;

Westcoast, 26.63; and Canadian-Montana, 24.96.

In addition to price, the board satisfied itself on two other main points—the availability of gas and the financing of the companies.

Evidence of adequate gas supply was overwhelming. Canada's total proved gas reserves were established at 30,300 billion cubic feet at the end of 1959. It is estimated that Canadian surplus supplies by 1989 will amount to 46,400 billion cubic feet compared with 9,300 billion now.

Other findings . . . The recommendations of the NEB, favoring the granting of the first export permits since 1956, followed a 6-week public hearing in Ottawa which ended February 12.

Of 19 intervenors, only the provincially-owned Saskatchewan Power Corp. bucked exports generally. It claimed proved reserves are insufficient to maintain assured economic domestic supplies as well as exports.

The report of the board, signed by Chairman Ian McKinnon, made it plain that the authorizations do not imply any commitment to approve additional exports in the future through the pipeline facilities involved in the successful applications.

It made this reservation in the case of both Trans-Canada and Alberta & Southern whose planned export facilities will have the capacity to handle larger amounts of gas than they asked for permission to export.

Any future applications for export to the Pacific Northwest would receive most critical examination, the board said, unless the gas was to come from northern British Columbia. It pointed out that the gas potential in that area needs to be explored.

Stock offers . . . The financing plans of two companies which will be involved in the gas export projects include public share offerings in Canada.

Alberta Natural Gas, which will operate wholly in Alberta, will offer 310,000 common shares at $10.50 each to Canadians. This is one-third of its common stock. The remainder is held equally by Westcoast Transmission and PGT.

The offering price to Canadians is 50 cents more than the issue price to the companies holding two-thirds of the stock.

PGT will give Canadians first chance at 25% of some 2,210,000 common shares. The price—$9.50 each—will again be 50 cents more than that paid by the private holders.

watching WASHINGTON

Clyde La Motte

• Unions might be an ally on some oil issues . . .

IT MAY BE that the industry sometimes misses a bet in failing to enlist the cooperation and support of oil unions in major issues affecting the industry.

For instance, active support by union membership of natural-gas legislation, percentage depletion or other nonlabor issues could be extremely valuable. Because protection for the consumer has been emphasized so much in the past—and will continue to be emphasized in the future—union support could help convince the public that gas legislation could be beneficial to consumers as well as to the industry.

And look at it from the viewpoint of a congressman. If he is approached by both labor and management on a given issue, he has fewer doubts than if approached by either alone.

There are a number of other areas in which unions and management conceivably could work together for the benefit of both. It seems a waste, therefore, when this isn't done.

It is true that the two often view each other with some trepidation, or outright suspicion. But aside from wage and work issues, there often is no reason why they could not unite in a particular program.

It wouldn't be the first time labor and management worked together in an effort to achieve a common goal. A current example is the part the coal unions are playing in the National Coal Policy Conference's effort to get a congressional committee appointed to make a fuels study.

The obvious strategy behind inclusion of the coal union in the NCPC was to give the drive a broader base, with more influence in Congress and with the public generally.

Naturally, the coal union members are interested in any program aimed at increasing markets. But just as naturally, oil unions would favor measures tending to keep the oil industry strong and healthy.

• Two complex offshore problems need settling . . .

THERE MAY BE developments in the months ahead on two offshore problems which could have more significance to the oil industry than the U. S. Supreme Court's decision on the Gulf Coast offshore boundary ruling.

One problem relates to California and the need for a settlement of federal and state disputes over the California offshore boundary. The other concerns offshore defense warning areas, particularly those in regions of present or future oil developments.

The California question is important to oil operators because of the high state royalties involved.

The warning zone issue could have even more impact because it would tend to foreclose oil and gas offshore development in many areas. Off the California coast, for example, there is a long target range. There is similar military gunnery activity in key Louisiana and Texas offshore locations. Even along the Atlantic Coast, where oil exploration is becoming more and more likely, the warning zone issue could become a real problem.

Interior officials say they are ready to begin preliminary talks with either an industry committee or state government officials on the California offshore boundary problem. This does not mean an early settlement, but it is likely that a start will be made before long.

The gunnery-range problem is more complex. It not only involves whether military use or oil development is more important, but it includes legal problems, too. For instance, does Interior, responsible for oil development, have authority over the Defense Department, or vice versa?

Remote Wildcat Moves Texas Oil Patch West

TEXAS' most remote wildcat—in far western Culberson County—is an indicated gas discovery.

The wildcat, Mobil Oil Co. 1 State-Barrett, is 40 miles east of closest production. It flowed 2,500 M.c.f. daily on calculated open flow during drill-stem test of the Permo-Pennsylvanian at 5,838-955 ft. Mobil plans to take the hole to 10,000 ft.

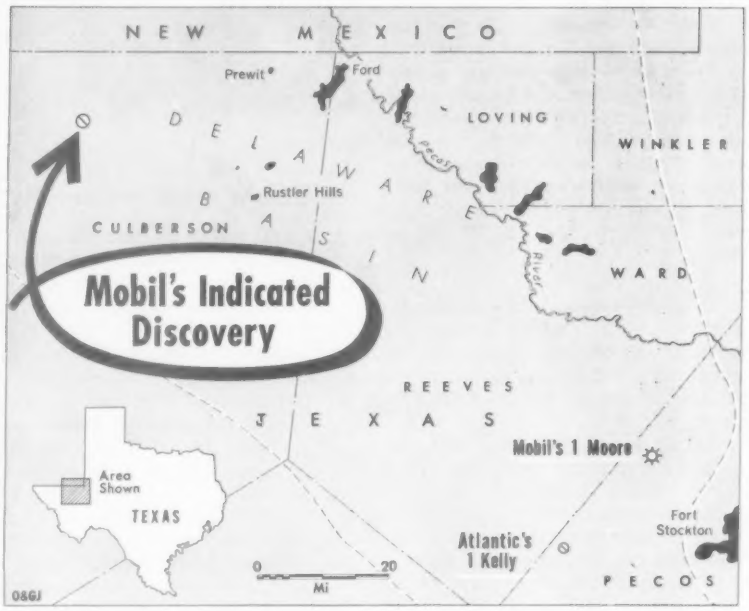
Location of the indicated strike is Section 18, Block 63, T-2, T&P Survey. It is 12 miles east of Pine Springs on the far western side of the Delaware basin. It's in a section of Texas which has no production and no nearby dry holes.

If successful, it will open the most western pool in the state and set off further development in a vast section of the basin.

Other activity . . . Mobil's Culberson County well is the latest newsmaker in the Delaware basin.

Recently, Mobil's 1 Moore, located 23 miles northwest of Fort Stockton in Pecos County, became the only Pennsylvanian producer in the Texas portion of Delaware basin. It flowed 102,000 M.c.f. daily and 1,500 bbl. of condensate and took over the spot as West Texas' deepest producer at 15,147 ft. (OGJ, Mar. 7, p. 64).

The title for deepest producer in that area may be taken over by Atlantic Refining Co.'s 1 Kelly, located 30 miles west of Fort Stockton. It still is drilling after finding gas in the Devonian at 15,873-923 ft.



The three Delaware basin developments have two things in common—new pays and remote production.

The Moore discovery and Atlantic's gas find will trigger a new era of deep hunting in the basin.

With only four Pennsylvanian fields in the basin, the Moore discovery takes on further importance. There are four Morrow fields in New Mexico's portion of the basin, all of them comparatively new.

Completion of Atlantic's well in the Devonian would make it the second Devonian producer on the Texas side of the basin. There are four pre-Permian fields on the Texas side, but three of them are abandoned. Toyah field is the only current Devonian producer.

The far western wildcat and the two Pecos County wells signal bigger things to come for the Delaware basin.

Sinclair's Proration Protested by New Mexico

THE NEW MEXICO Oil Conservation Commission has set for hearing April 13 a Sinclair Crude Oil Co. order reducing crude purchases in the state by 20%.

The Commission charges the reduction is discriminatory. It wants Sinclair to show cause at the hearing for the 14,000-bbl.-daily cutback which went into effect March 23.

Sinclair's prorating of purchases also went into effect then in Kansas and the Julesburg basin.

The New Mexico commission withheld its approval of the plan and made this statement after an emergency session:

"We feel that New Mexico is being discriminated against. We feel the reduction should have been borne by all the states in which Sinclair is a purchaser."

Sinclair officials said the cutback was necessary to reduce excessive stocks and congestion at some delivery points caused by reduced refinery runs.

The commission's executive director, A. L. Porter, said the members realize that proration is sometimes necessary "no matter how distasteful to all concerned," but it could not sanction Sinclair's "discriminatory" plan.

Instead of issuing an emergency order allowing the buyer to cut purchases below allowables, the commission ordered the show-cause hearing which will be at Hobbs.

In letter to Sinclair President D. A. Young, the commission stressed these points in objecting to the reduction:

. . . The reduction was confined to four states instead of including all states in which Sinclair buys crude.

. . . Allowables were cut in southeastern New Mexico for 2 months running "in keeping with commission policy of establishing allowables in accordance with market demands."

. . . Purchases by Sinclair in New Mexico exceed the company's New Mexico nominations "by a considerably smaller percentage than your purchases in Texas exceed your Texas nominations, yet you do not intend to prorate in Texas."

The commission also said that for several months Sinclair has purchased 7,000 bbl. daily in Utah to be transported across New Mexico to a terminal at Jal, N. M. This crude competes with the prorated oil of Southeast New Mexico and West Texas, but the company does not intend to prorate Utah purchases, the letter stated.

Preparing site
and building a haul road

CAT NO. 955 TRAXCAVATOR VERSATILITY PAYS OFF AGAIN

The drill site is a dry lake bed near Rochester, Tex. But it's not as easy as it sounds. There's water beneath the surface and plenty of sinkholes to trap trucks and other equipment. To overcome these hazards, Tucker & Stephens of Graham, Texas, has the job of building a haul road and preparing the site for the rig.

T & S trucks haul fill from a stockpile at an old drill site nearby. A Caterpillar No. 955 Traxcavator loads 5-yard trucks in about two minutes. No time wasted.

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More Leasing Off California in the Mill

• Shell has nominated about 50,000 acres off Santa Barbara County for leasing and others may get into the act soon.

THE ALMOST 2-year lapse since any California offshore land was put up for leasing could very well come to an end shortly.

For one thing, Shell Oil Co. has asked that about 50,000 acres off Santa Barbara County between Point Conception and the Elwood oil field be offered for leasing. Shell divided the acreage into nine parcels in making its application.

With the Shell requests in the hopper, the State Lands Commission has indicated it would be an excellent time for any other companies interested in offshore lands to make their wishes known. No other nominations have been received as yet.

The Shell parcels include practically all the unleased tidelands between the old Elwood field and Point Conception. The requests cover all the land between the five parcels leased in July 1958 and some acreage at the west end of the string of blocks.

Those five 3,840-acre parcels attracted a record $55.5 million in cash bonus bids (OGJ, July 7, 1958, p. 72). Since that time, core drilling has indicated that probably at least three of the five—C, D, and E—will eventually prove productive.

Although the 1958 bidding was strictly on a cash bonus basis, the law has been changed since and the state can now offer acreage on either cash bonus bidding, straight royalty bidding, or combination of the two.

Under the state setup, the State Lands Commission can go ahead and offer additional acreage on its own hook without waiting for any specific requests from oil companies. There was some speculation that the state might just do that as long as they will be processing the Shell requests anyway.

Parcel D first . . . Of the five parcels leased in 1958, Parcel D is almost certain to be the first to hit the commercial production column. Texaco Inc., as operator for itself, Monterey Oil Co. and Newmont Oil Co., expects to have a platform on the lease around July 16.

The 28-well, double-decked platform will be built in 94 ft. of water 1½-miles offshore. The top deck of the 130-ft.-by-138-ft. platform will be about 50 ft. above the water.

On an earlier coring program one hole tested at a rate of 1,383 bbl. daily of 35°-gravity crude.

Parcel D has been the most attractive area since the time oil companies took their first serious look at the tracts up for leasing in 1959. And the tract brought the highest price at the lease sale—$23,711,538 or $6,175 an acre. This is far above any price paid in recent years for a lease either off California or in the Gulf of Mexico.

Of the other four parcels, C and E also appear good bets to join the producing list in time.

Standard Oil Co. of California and Humble Oil & Refining Co. reported encouraging shows in three core holes drilled on their jointly held Parcel C. No platform plans have been hinted at yet. But California Standard, as operator, has in the works a slant-drilled wildcat from an onshore site for the parcel in the near future.

Phillips Petroleum Co., in company with 40 other companies and individuals, reportedly is studying the possibility of converting a mobile drilling platform now idle on the West Coast into a permanent drilling platform on Parcel E.

It's generally believed Parcel B is a bust. One core hole drilled by California Standard and Humble failed to turn up anything. This development seems to justify the fact that this parcel attracted the smallest bid at the 1958 lease sale.

Parcel A, the most easterly of the five, is also pretty much an unknown quantity. One core hole was drilled on it to 7,355 ft. in 180 ft. of water. While nothing was released on what it turned up, the operator did indicate it was capped in a manner which will permit re-entry.

Phillips is operator in both Parcels A and E. Phillips heads a combine which includes Edwin W. Pauley, Los Angeles independent, Kerr-McGee Oil Industries, Inc., and 39 other companies and individuals.

PROCESSING

Oronite Chemical Co. has brought on stream the "largest detergent polymer facility in the world" at its newly completed plant in Richmond, Calif. Capacity of this multimillion plant was not released.

Standard Oil Co. (Ind.) has introduced a new fuel especially designed for diesel engines. The fuel was developed to improve performance and reduce maintenance problems.

The first commercial Hydrar unit for production of high purity cyclohexane from benzene is now on stream at Gulf Oil Corp.'s Port Arthur, Tex., refinery. The facilities were designed by Universal Oil Products Co. and constructed by Procon, Inc.

Pilot Flood on Tap

. . . for North Texas field.

Plans before commission.

OPERATORS in North Texas' Sherman (Baker sand) field plan to launch a pilot water flood soon which they expect to expand field-wide eventually to recover an estimated 26,000,000 bbl. of added oil from the pool.

A permit to unitize and start the pilot project was filed with the Texas Railroad Commission in late March by Standard Oil Co. of Texas. It is awaiting approval.

Standard engineers told the commission the planned project would replace one approved in May 1959 on a different lease but never started. The original pilot was planned for the Clinton, Kraeger, and Head leases. The new one would be on H. L. Hunt's Sara F. McRae lease.

The company said that more than 87% of royalty and 96% of working interests have signed the unit agreement. The proposed unit would take in 3,209 of the 3,870 acres estimated productive in the field.

Standard engineers testified that the area is reaching the final stage of depletion, though it has produced only about 3,300,000 bbl. of a volume of about 104,000,000 bbl. estimated to be in place in the reservoir originally.

Deep Texas Wildcat Testing

HUNT OIL CO. has bottomed out its deep rank wildcat in Webb County, South Texas, at 20,603 ft. and plugged back to test shallower horizons.

The deep test, the 1 J. O. Walker in Section 476, S&M Survey, is located roughly 21 miles southeast of Encinal.

At midweek, operator had completed testing the Edwards lime topped at 18,850 ft., found it barren, and plugged back to test gas shows in the basal Wilcox at around 9,000 ft. There is no deep production in the area, though a couple of 1-well fields produce nearby from the Wilcox at 3,000-4,000 ft. level.

The Hunt wildcat was spudded early in August last year, making its 20,600 ft. of hole in the highly respectable time of only 7 months.

Work on Katy Line to Begin

SECURITIES to finance Mid-America Pipeline Co.'s LPG and natural-gasoline line have been sold, and construction on the $71,742,500 system is scheduled to start this week.

The 2,300-mile system will be 8 and 10-in. from Eunice, N. M., to McPherson, Kans., with an 8-in. branch to Minneapolis and a 6 and 8-in. branch to Madison, Wis. (OGJ, Mar. 28, p. 109).

Williams Brothers Co., the turnkey contractor, plans to put the first of four spreads in the field this week near Pampa, Tex. Right-of-way clearing and grading will be started at this point, and within 2 weeks another spread will begin work near Arlington, Kans. The other two will kick off in May. First pipe shipments left the mill last week.

The pipeline, promoted by the Missouri-Kansas-Texas railroad, expects to be in business in December.

Merger Vote Set

. . . for Industrial Rayon and Texas Butadiene.

THE PROPOSED merger of Industrial Rayon Corp. and Texas Butadiene & Chemical Corp. will be voted on by shareholders of both companies April 29.

Industrial Rayon would be the surviving company. Texas Butadiene stock would be converted into Industrial Rayon.

Principal stockholders of Texas Butadiene are Godfrey L. Cabot, Inc., and associates of Carl M. Loeb, Rhoades & Co., Inc. About 20% of the shares of Industrial Rayon are owned by M. A. Hanna Co.

Under the merger plan, Hayden B. Kline, Industrial Rayon president, would become board chairman, and D. Fennebresque, Texas Butadiene president, would become president and chief executive officer.

Industrial Rayon produces tire cord, textile yarns, polypropylene fibers, and nylon stable and bulk filament yarns.

Texas Butadiene produces aviation gasoline, butadiene, and other petrochemicals at its Channelview, Tex., plant. It is now expanding the butadiene plant from a capacity of 90,000 to 120,000 tons a year. Work is to be completed in the fourth quarter. It also has a 30% interest in a synthetic-rubber plant being built near Marseilles, France, and is negotiating with Argentina for construction of a plant there.

BRIEFS . . .

Completion of a $1½ million construction program at British American's Calgary refinery is expected this fall. The project included expansion of catalytic reformer capacity and condensate handling facilities, installation of a 3,500-bbl. naphtha desulfurizer, and modernization of the instrumentation and control systems. This work will increase the refinery's crude capacity from 7,500 to 10,000 bbl. per day.

A multipurpose automotive lubricant, Darina AX, has been developed by Shell Oil Co. The grease, for commercial and fleet operation, is designed to lubricate mobile equipment under adverse and extreme climatic conditions. It is based on a new waterproof thickener developed by Shell.

El Paso Natural Gas Co. will build a plant in Brown-Bassett field in Terrell County, Texas, to treat 100,000,000 cu. ft. of natural gas containing 53% carbon dioxide. This plant, costing more than $3 million, is scheduled to be completed in December 1960.

Facilities are being installed at Delhi-Taylor's Corpus Christi, Tex. plant to separate 70 million pounds per year of high purity orthoxylene from a mixed xylene stream. Completion is expected in June 1960.

A sulfur-recovery plant will be built near Tilden, in McMullen County, Texas, by Trans-Jeff Chemical Corp., Houston. The new company is jointly owned by Transcontinental Gas Pipe Line Corp. and Jefferson Lake Sulphur Co.

Also for Refiners . . .

IN THE NEWS: Canadian Government's decision on allowing gas exports to U.S. pulls cork on $250-million worth of processing-plant projects (p. 83) . . . New Mexico protests Sinclair's purchaser proration (p. 86) . . . Work starts on Mid-America Pipeline after Katy gets financing for the West Texas-to-Wisconsin products line (p. 89) . . . New petrochemical construction planned for Europe (p. 103).

PLUS THESE TECHNICAL REPORTS: Refining piping work simplified (p. 115) . . . Quality survey of Cracking Catalysts (p. 121).

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Here's what scouts came up with on first rig count

State—	April 1, 1960 Rotary Rigs	Cable Rigs	Total Rigs
Alabama	4	0	4
Alaska	6	0	6
Arizona	3	0	3
Arkansas (No Report)	....	....	....
California	120	2	122
Colorado*	31	27	58
Florida	1	0	1
Georgia	1	0	1
Idaho*	0	0	0
Illinois	34	12	46
Indiana	11	10	21
Kansas	94	12	106
Kentucky*	27	44	71
Louisiana	348	0	348
Michigan (No Report)	....	....	....
Mississippi	61	0	61
Missouri	1	0	1
Montana	14	2	16
Nebraska*	37	8	45
Nevada*	0	1	1
New Mexico	118	29	147
New York (No Report)	....	....	....
North Dakota	21	0	21
Ohio (No Report)	....	....	....
Oklahoma (No Report)	....	....	....
Pennsylvania (No Report)	....	....	....
South Dakota	1	1	2
Tennessee (No Report)	....	....	....
Texas			
District 1	27	1	28
District 2	56	0	56
District 3	101	0	101
District 4	73	0	73
District 5 & 6	65	0	65
District 7-B	79	11	90
District 7-C & 8	217	17	234
District 9	111	4	115
District 10	77	10	87
Texas—Total	806	43	849
Utah*	29	0	29
West Virginia (No Report)	....	....	....
Wyoming	57	6	63
Total U. S.*	**1,825**	**197**	**2,022**

*Incomplete data.

Oil Scouts Launch Rig-Counting Program

A NEW WEEKLY tally of active rotary rigs was circulated to the industry for the first time last week.

The new rig check is compiled by the International Oil Scouts Association.

The first report, planned as a trial run, had the usual crop of first-venture bugs. But the IOSA expects to have these ironed out soon.

Missing from the trial report were such important drilling states as Oklahoma and Arkansas. Minus these and a few other important regions, the scouts counted a total of 2,022 rigs active—1,825 rotaries and 197 cable-tool rigs.

The new tally is being distributed by the American Association of Oilwell Drilling Contractors along with the long-established count by Hughes Tool Co.

The IOSA report differs considerably from the Hughes report in several important respects (OGJ, Feb. 22, p. 74).

It includes both rotary and cable-tool rigs and reports them separately. Its definition of "active" is considerably broader, too. The Hughes count reports only rotaries—and only when the rotary table is actually turning. It does not count a rig which is rigging up, tearing down, cementing, logging, testing, or fishing. The scouts' tally will include all of these.

Drilling contractors generally regard their rigs as active when so engaged and that a count which shows how many are actually working and not available is a real need. So the new count classes a rig as active from the time it starts rigging up until it is released by the operator.

Hope to plug holes . . . Though the new check will have coverage weaknesses in some spots to start, the IOSA hopes to correct most of them.

Oklahoma and Arkansas definitely will be covered. Their absence in the first report was a slipup.

The actual holes in the report in other states such as New York, Michigan, Ohio, West Virginia, Pennsylvania, and Tennessee are due to the lack of any local scout check in these states. The actual rig counting is being done by various local checks over the country and the area reports funneled into the association's headquarters in Austin, Tex., each week for compilation.

The scouts, according to M. R. Proctor, chief scout for Atlantic Refining Co. and chairman of the IOSA rig-count committee, hope to fill in most of these holes through other arrangements.

Along with the lack of any reports from these states, there was a lack of complete data from five other states: Colorado, Idaho, Nebraska, Nevada, Kentucky, and Utah.

In Colorado, for instance, rigs working in the important Denver-Julesberg basin area were not counted due to lack of a local scout check in that area. The IOSA hopes, Proctor said, to correct these deficiencies, too.

Despite the omission of such active drilling areas as Oklahoma, Arkansas, and the Denver Julesberg basin, the IOSA check listed 79 more rigs due to its broader definition of "active" than did the comparable Hughes report of April 4 which tallied 1,746 (see complete Hughes table on p. 201).

Just how much the addition of these missing areas would hike the IOSA rotary count is uncertain. But some guess as high as 300-400 rigs or more.

An accurate count of the cable-tool rigs in such states as New York, Pennsylvania, Ohio, West Virginia, Michigan, and the Green County area of Kentucky; likewise would be certain to boost this figure substantially.

IPAA Goal: Gas Legislation This Year

• Association is mapping strategy despite obstacles of too little time and too much politics. Reasoning behind move: There's no risk because there's nothing to lose by pushing for action in this session.

THERE SEEMS to be no question now that the Independent Petroleum Association of America intends to drive ahead this year in an effort to persuade Congress to pass natural-gas legislation.

The question that does remain is how fast and how far the IPAA will be able to go.

Outside IPAA, the consensus in Washington is that the association has too little time and is facing too much politics to succeed this year.

But IPAA leaders aren't willing to concede that there is no hope. They are going right ahead mapping an aggressive campaign along these lines:

They will seek to get legislation introduced which will include the basic elements they have outlined for such a bill.

Then they will attempt to persuade President Eisenhower to give that legislation his specific endorsement. If they get that, they will return to Congress with an urgent request for hearings and for action.

Why is IPAA so dead set on making its move now?

One of its leaders put it this way: "We have tried the waiting game and it hasn't gotten us a gas bill. So we are going into action now, figuring there is no point in waiting any longer.

"If we lose, we don't get the gas bill this year. But we don't have it anyway, so we're really risking nothing."

Timing no problem . . . The IPAA figures, too, that there is no reason why it shouldn't get as much support from the industry as a whole right now as it would next year or some other year.

And it reasons there are no grounds for supposing that a wait of another year or so would cause opposition to a bill to melt away.

The association gives little weight to the argument that its timing is bad because this is a "political" year. Nor does it agree that a drive now—should it fail—would ruin the chance for a gas bill later. As far as that goes, some IPAA leaders imply, momentum generated this year could be carried over into next year if the current effort doesn't succeed.

By contrast, they contend, a lack of action could be interpreted to indicate that the industry doesn't really need a gas bill very badly or it would be trying to do something about it.

To support this point, they are citing a reported exchange of remarks on the subject between President Eisenhower and Treasury Secretary Robert Anderson in which the President asked if the industry still wanted gas legislation. When Anderson assured him that it did, the President reportedly wondered aloud why it wasn't working for such legislation.

A producer's bill . . . Having committed themselves to action, IPAA leaders are pushing ahead with their plans.

An IPAA committee has drafted the basic elements of a bill it wants the administration and Congress to consider. These proposals have already been circulated to IPAA's full gas committee and very shortly will be given general circulation.

Basically, the IPAA is proposing a producer's bill.

It would remove gas production activities from control by the Federal Power Commission. Instead, FPC control would start at the point the gas moves into an interstate pipeline.

It would require the FPC to consider producer gas as a commodity and not as a utility service. In this way, the FPC would have no jurisdiction at all over producers, producer facilities, or producer contracts. Producers no longer would have to obtain certificates of convenience and necessity in order to sell their gas to the pipelines.

As a substitute for control of producers, the FPC would be authorized to limit the amount pipeline companies could pay for the gas to no more than "the reasonable market price."

In determining what a reasonable market price should be, the IPAA suggests that the FPC consider such points as these:

Whether the price will assure consumers a continuing adequate supply, whether the contract price was reached in arm's length bargaining, the reasonableness of provisions relating to the determination of future prices to be paid, the quality of the gas purchased, the location of the production, conditions of delivery and the level of prices paid under other contracts in the same area.

Under the IPAA proposals, prices based upon definite pricing clauses in existing contracts would be ruled valid.

If, under new contracts, the commission should rule that definite pricing clauses would result in prices higher than "the reasonable market price," the new contract would be voided. This would leave each party free to do business elsewhere or to negotiate new terms.

On indefinite pricing clauses, the commission would be authorized to act only if the resulting price should exceed the reasonable market price. In such cases, the contract would not be nullified but the price would be cut back to the "reasonable" level.

Other effects . . . The IPAA's proposals also would include these points:

All tax reimbursement provisions in purchase contracts would be deemed valid, and all pending proceedings before the commission involving natural-gas contracts would be dismissed except those in which the reasonable market price might be exceeded.

The IPAA plan does not attempt to dispose of the issue of a proper pric-

PIPELINE

Contract to recondition 60 miles of 4-in. and 40 miles of 12-in. products line has been awarded to an Atlanta firm, Latex Construction Co. of Georgia, by Plantation Pipe Line Co. The project got under way last week with headquarters at Thomaston, Ga., under Supts. J. M. Phipps and G. H. Matlock.

A 60,000-bbl.-daily products line from New Haven, Conn., to Springfield, Mass., has been proposed by New Haven Pipeline, Inc., headed by Harold M. Geller, president. The line would be 12-in. to Hartford and 10-in. from there to Springfield with a 6-in. spur to Westover Air Base at Ludlow, Mass. Geller said the New Haven Railroad had granted an easement for line along its right of way.

ing formula for production by the gas pipeline companies themselves.

However, the exclusion of all gas-production activities from FPC jurisdiction obviously would include production by the pipelines themselves. Furthermore, the yardstick of a reasonable market price apparently would also apply to the pipeline companies in regard to their own gas production.

The IPAA maintains that the proposal would provide the protection to consumers that the President and others have insisted upon.

This protection, they say, arises in two respects:

By assuring consumers an adequate supply of natural gas, it guards against high prices which would result should a shortage occur. That is, a "reasonable" price would encourage gas exploration and production, whereas stringent, unrealistic controls would discourage such activity and tend to create shortages.

The limitation of pipelines to payments of a reasonable market price for the gas they buy would protect the consumer from price gouging.

To some observers, it might appear that the IPAA proposals virtually amount to a return to the pre-Phillips case days when producers were not under FPC control.

The big difference as IPAA sees it, however, is this: In those days, the price paid to producers by a pipeline company was not within FPC jurisdiction. Only the pipeline sales and rate of return were subject to FPC action.

Under the IPAA plan, there would be a ceiling on the price the pipeline could pay, that ceiling being the "reasonable market price."

Crude Line Set for Alaska

. . . to link Swanson River and Soldatna Creek fields to new marine loading facilities on Cook Inlet. The 20-mile 8-in. line will be completed by mid-1961.

PLANS for Alaska's first crude-oil pipeline and marine loading facilities were announced last week by Standard Oil of California.

The 20-mile 8-in. common carrier will link the Soldatna Creek and Swanson River fields and a new terminal at Nikiski on the Cook Inlet. The project will cost more than $4 million and is scheduled for completion by mid-1961.

Standard of California said last week the entire system will be owned by the Kenai Pipeline Co., a newly formed operating affiliate. The first construction will be storage facilities at Nikiski and will begin in several weeks. Work on the line will start as soon as the right-of-way is obtained.

The pipeline will include a pump station plus a feeder station at the center of the Swanson River producing area.

Principal engineering problem of the entire project will be the marine terminal on the Cook Inlet. Tidal action at the location produces currents with a water velocity of as much as 7 knots and water level variations of 25 ft. The terminal will consist of a 1,000-ft. causeway leading to a dock built in 40 ft. of water. The new terminal will accommodate tankers up to 28,000 tons.

Production involved . . . The Soldatna Creek production to date is from one well—Alaska's largest.

This find, Soldatna Creek Unit well 41-4, was tested last month for 1,870 bbl. per day on a ½-in. choke. It is currently producing at a maximum efficient rate of 700-800 bbl. daily.

Standard of California and Richfield Oil Corp. hold 92% of the 72,000-acre Soldatna Unit, which adjoins the Swanson River Unit on the south. Standard of California is the operator in both the Soldatna Unit and at Swanson River.

Sharing the 71,000-acre Swanson River Unit with Standard of California and Richfield are Union Oil Co. of California and Ohio Oil Co.

Six producers have been finished at Swanson River and two more are drilling.

Of the six Swanson River producers, four were in the 300-550 bbl. class, one made only 50-100 bbl., and one flowed 1,000 to 1,300 bbl. daily.

The Soldatna Creek well, besides having the highest flow in the state, has a reported sand thickness of 230 ft. No other Alaskan well has reported such a pay as this. The wells in Swanson River and the Soldatna Creek strike produce from the same Eocene Hemlock sands.

BRIEFS . . .

Some 54 miles of large-diameter crude line will be laid by Buckeye Pipe Line to extend its system in Michigan. Buckeye's 22-in. line will be extended from Toledo to Samaria, Mich., and a 16-in. line will be built from Samaria to refineries at Trenton and Detroit. The project, including tankage, will cost more than $4 million. Buckeye plans to convert some lines in the area to products service.

The first gas turbines on a Canadian pipeline are planned by Trans-Canada Pipe Lines to boost capacity to export gas into the U. S. Midwest. (See story p. 83.) Of the eight new stations to be constructed by October 31, 1960, six in Saskatchewan and Manitoba will be gas-turbine-driven centrifugals. Two in Ontario will be conventional reciprocating engine compressors.

Contract for a 126-mile 30-in. line for El Paso Natural Gas Co. has been awarded to R. H. Fulton & Co., Lubbock, Tex. The line is on El Paso's Permian-San Juan crossover loop. Completion is scheduled in the fall. The company also has under way station expansions totaling 29,000 hp. under contract to Bowden Construction Co., Delta Engineering Corp., Fluor Corp., Western Pipe Line, Inc., and Fisher Contracting Co.

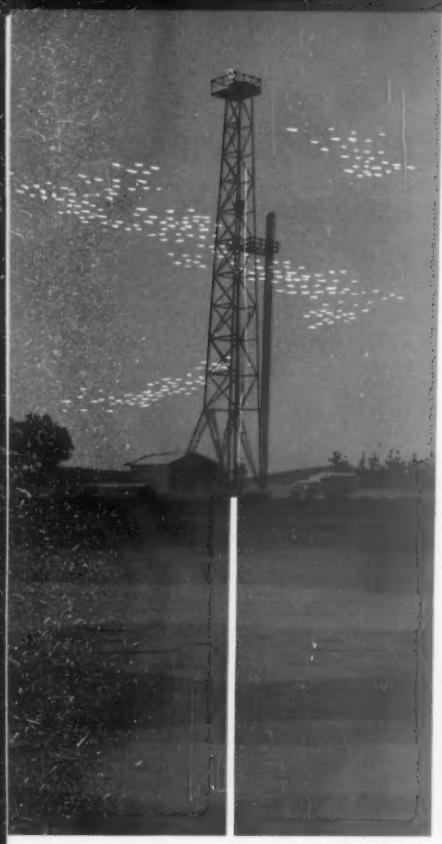
Bids will be received April 18 on a 58-mile 8-in. products line to be built by Great Lakes Pipe Line Co. from Grinnell to Waterloo, Iowa. Great Lakes is building a terminal at Waterloo.

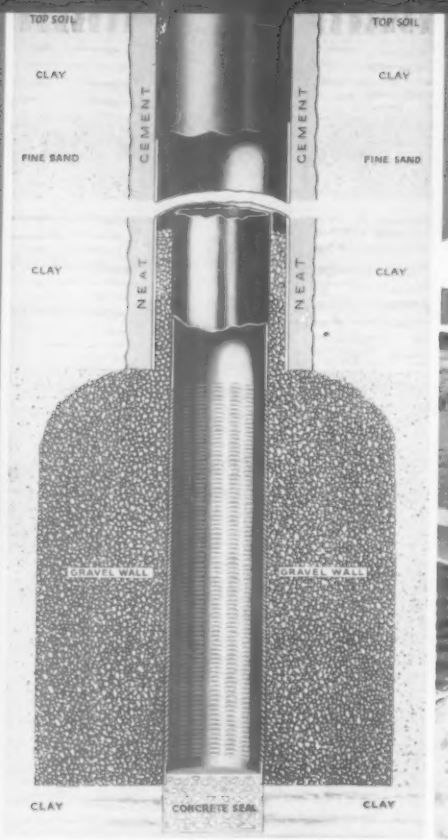
Also for Pipeliners . . .

IN THE NEWS: Approval of gas exports by Canadian Government opens way for $6.8-billion spending in the 10-year period ending in 1968 (p. 83) . . . Work starts on products line from West Texas to Wisconsin (p. 89) . . . IPAA definitely will push for natural-gas legislation this session (p. 92) . . . Crude line planned in Alaska to link Swanson River and Soldatna Creek fields to new marine terminal on Cook Inlet (p. 93).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are covered in Pipeline Briefs.

PLUS THIS TECHNICAL REPORT: YPF pipeline is one of world's largest (p. 107).





WATER WATER WATER

With A Layne Drilled Well Layne knows where the water-bearing formations are located. They have been drilling wells for over 75 years. This experience comes from searching and researching water aquifers. Knowing *where* to drill is half of the success—knowing *how* is the other half. In drilling a straight well experience counts—and you can count on Layne. Layne specializes in water well drilling. To get a good start for a water supply—you need a good well. You get a good, producing well when you specify a Layne drilled well. *Bulletin No. 100*

With A Layne Gravel Wall Well This technique and resulting arrangement of the new 134 Shutter Screen and gravel (shown here) permits the free flow of water into the well and affords the following advantages: larger shutter screen openings, reduced friction, reduced draw down and pumping head—thereby reducing pumping costs, increased specific capacity and more effective retention of native sands. Cemented wells are installed if indicated, and result in greater purity of supply as well as increased life of the well. *Bulletin No. 900*

With A Layne Vertical Turbine Pump Whatever the pumping requirement, there's a Layne pump to meet any pumping conditions. Layne Vertical Turbine Pumps come in a wide range of sizes and capacities, delivering 30 to 20,000 GPM and requiring from 4 to 42 inch well casings. The complete line of Layne Pumps include: Deep Well Vertical Turbine (oil or water lubricated), Short Coupled Vertical Turbine, Propeller, Mixed Flow, Fire Pumps and Volatile Liquids Pumps, Regular and "In-Line" Submersible. *Bulletins No. 200 (oil) 201 (water)*

LAYNE OFFERS COMPLETE WATER SERVICE: Initial surveys • explorations • recommendations • site selection foundation and soil-sampling • well drilling • well casing and screen • pump design, manufacture and installation construction of water systems • maintenance and service • chemical treatment of water wells • water treatment—all backed by Layne Research. Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

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Rust-Causing Bacteria Stopped by Boron

• Refiners get tips on how to fight rust, stop catalyst poisoning, and beef up octanes at ACS meeting.

BORON, familiar in the oil business as a gasoline additive, also is an effective killer of the bacteria which causes rust in the water bottoms of gasoline storage tanks.

The use of boron in fighting rust was outlined last week at the annual meeting in Cleveland of the American Chemical Society.

The ACS also heard reports on how:

... **Irraditation** may help decrease the volatility of metals in refinery stock. This will help solve the problem of catalyst poisoning in cat crackers resulting from metals in gas oil from vacuum columns.

... **Octane losses** caused by phosphorous additives can be eliminated by more careful selection of the type of phosphorous compound.

Killing bacteria . . . R. J. DeGray and L. N. Killian, of Standard Oil Co. (Ohio), pointed out bacteria tend to congregate at an iron-water interface and breed intensively.

Once rust gets started, things get worse. The more bacteria there are, the more rust there is. The more rust there is, the faster the bacteria multiply.

Many bacteria act on hydrocarbon. Fighting these bacteria with conventional rust inhibitors is no help since the inhibitors are surface-active agents. A surface-active agent will reduce interfacial tension between the hydrocarbon and water, which in turn increases the dispersion of hydrocarbons in the water phase—and this actually encourages the bacteria to multiply.

Bactericides are the answer. DeGray and Killian found striking results using the boron gasoline additive developed by Ohio Standard. With an accumulation of 0.05% elemental boron in the form of gasoline additive in the water bottoms of a tank, bacteria were killed.

Since boron additive is used in gasoline for other benefits, they pointed out, bacterial control is almost without cost. Concentration of boron required will depend upon the compound that is used.

Metal volatility cut . . . Development of practical methods to eliminate metals in crude oil has been hampered by the lack of knowledge of the fundamental properties of these metals.

Accordingly, a study was undertaken by H. N. Dunning and J. W. Moore, Petroleum Research Center, Bureau of Mines; H. Bieber, Esso Research & Engineering Co.; and R. B. Williams of Humble Oil & Refining Co. to find the relationship between these metals and some of the complexes they form with compounds found in crude oil.

One of the results of this study suggets the use of irradiation as a technique to decrease the volatility of these metal complexes.

For instance, in one test, a sample of South Louisiana gas oil was enriched with metals by adding a similar metal-porphyrin concentrate from Bachaquero crude oil. Part of this enriched gas oil was subjected to a gamma irradiation of 70 million roentgens. Then both samples were distilled. The volatility of the irradiated metal compounds was markedly less than those in the original sample.

Octane losses eliminated . . . Organophosphorous compounds in leaded gasoline are widely used to control surface ignition and inhibit sparkplug fouling.

However, many of the substituents of these phosphorous compounds will react with tetraethyl lead, thus reducing its effectiveness. Halogens and alkyl ester groups are two of the most common offenders.

These are some of the conclusions in a study on phosphorous compounds conducted by F. C. Gunderloy, Jr., and R. F. Neblett, both of Esso Research & Engineering Co.

They pointed out that octane losses may be eliminated or decreased by selecting compounds with nonreactive substituents; selecting structures to which reactive substituents are bonded more securely; or selecting compounds in which the structure of the substituent inhibits its inherent reactivity.

INDUSTRY BRIEFS . . .

The producing properties of Ring Oil Co., Los Angeles, have been acquired by Producing Properties, Inc., Dallas. Included are 176 wells on 35 leases, primarily in heavy crude California fields. PPI paid $1,750,000 for the estimated 3,100,000 bbl. of net reserves. Current production from the wells is about 1,200 bbl. daily.

Operation of Woodley Petroleum Co. properties has been assumed by Pure Oil Co. The properties include 279 oil and 17 gas wells in the U. S. and Canada. Crude production averaged 9,477 bbl. a day in 1959. For the next several months Woodley's producing properties will be operated as a Pure producing division with headquarters in Houston.

Pure Oil Co. has developed a new all-purpose grease, now being introduced in its 24-state marketing area. The new lubricant, Pure says, has been tested successfully in chassis fittings, wheel bearings, universal joints, fifth wheels, and water pumps.

Texaco Inc. will return to Houston April 26 for the first time in 33 years to hold its annual stockholders meeting. Texaco began business in 1902 in Texas and held annual meetings at the Houston office until 1927, when it switched to New York.

Occidental Petroleum Corp. of Los Angeles will drill three new wells in Roberts County, Texas Panhandle, if creditors and stockholders of Parker Petroleum of Ponca City, Okla., approve the company's reorganization. Occidental would buy 1,300,000 shares of Parker common stock, giving it a 51% interest. Parker has interests in 202 producing oil and gas wells in Texas, Oklahoma, and Kansas.

Colorado has refunded a half-million dollars in oil and gas severance taxes which were ruled illegal by the state Supreme Court. The court held that retroactive features of the tax were unconstitutional. The largest refund, $381,856, went to The California Co., the challenger of the tax. Calco has asked the U. S. Supreme Court to rule on whether the tax is constitutional.

United States Sulphur Corp. has opened a sulfur mining and manufacturing plant at High Island Dome, 38 miles east of Galveston. The company anticipates production of 1,200 tons of sulfur daily by late summer. Texas Gas Corp. laid a 9-mile natural-gas pipeline to the plant.

Some Powerhouse Firms Work on Fuel Cells

• Development of the device into a satisfactory power plant is foreseen by two SAE speakers. Four systems are getting the most attention.

THE FUEL CELL is not just around the corner, but it may not be as far away as you might think.

One thing is sure: A lot of people are working to develop an economic application. The extent of the research in this field indicates the confidence that such a process will be found.

Two speakers at last week's SAE National Aeronautical meeting in New York reported rather optimistically on the fuel cell's future:

"There is no doubt that the fuel cell can be developed technically into a satisfactory power plant," said Anthony M. Moos, vice president and general manager, Patterson Moos Research Division, Leesona Corp.

"From the economic factors involved, a carbonaceous fuel-atmospheric air cell can produce power at a very attractive operating cost of between ½ cent per kw.-hr. to 4 cents per kw.-hr.," said E. A. DeZubay, Research Division, Curtiss-Wright Corp.

According to Moos, technical feasibility has already been shown in four systems. The systems and the companies working on them are:

... Low-temperature (50-150° F.), low-pressure (1-50 psi.) hydrogen-oxygen or air fuel cells. Standard Oil Co. (N. J.), National Carbon, General Electric, Electric Storage Battery, and Allis Chalmers in the U. S., and Ruhrchemie in Germany are active in this field.

... Medium-temperature (400 to 600° F.) and high pressure (400 to 1,000 psi.) hydrogen-oxygen fuel cells. This work is being carried on by United Aircraft and Leesona Corp., in the U. S. and F. T. Bacon in England.

... Fuel cells with low temperatures using hydrocarbon fuels and oxygen. Work is being pursued in this area by Allis-Chalmers, National Carbon, Jersey Standard, and Leesona Corp., in the U. S. and by Ruhrchemie in Germany.

... High-temperature (400 to 1,000° F.) fuel cells using hydrocarbons and air. These cells generally operate at low pressures and use fused salts as electrolytes. General Electric, Curtiss-Wright, Leesona, United Aircraft, and Pittsburgh Consolidation in the U. S.; Ketelaar in Holland; and Sondes Place Research Institute in England are following this line.

Moos said the military is very much interested in fuel cells. It sees possible applications ranging from 1,000 kilowatt power plants for submarines to 1 kilowatt systems for scientific and observation satellites.

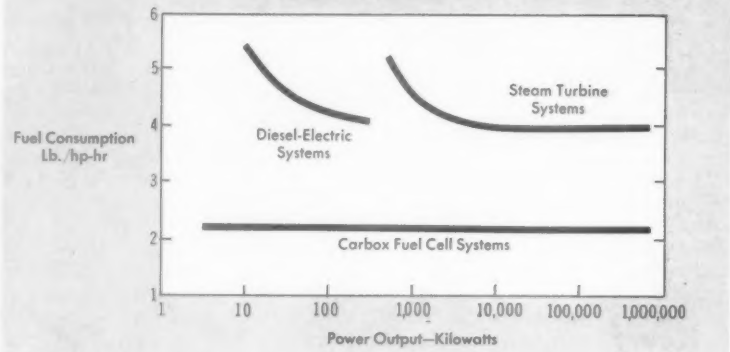
These are the fuel cell advantages from a military standpoint: Maximum power density (kw. per lb.), power per unit volume (kw. per cu. ft.), and energy density (kw.-hr. per lb.); and reliability and ability to operate over a wide temperature range under conditions of shock and vibration encountered by weapon systems.

Economic considerations will determine the size of the fuel cell market, Moos said. The principal factor is fuel consumption per horsepower-hour—about 80% of the cost of electrical power at a generating station is fuel. The Carbox fuel cell system would use from less than 40 to not more than 50% as much fuel as diesel-electric or steam generating systems (see chart).

Moos sees industrially produced electrical power as the first market for fuel cells. The will not replace existing installations but supplement them. He sees this market growing rapidly as public utility energy production trebles in the next 20 years.

How Fuel Cell Compares

... using hydrocarbon fuels



Alberta Demand Facing April Slump

REFINERIES of Alberta crude oil are seeking less oil for April, according to figures of the Alberta Oil and Gas Conservation Board.

The figures show only 329,115 bbl. will be taken in April. This is a decrease of 51,585 bbl. daily from the March total.

Although exports to the U. S. will be up slightly, Ontario refiners have cut their nominations from 130,350 bbl. daily to 88,100 bbl. daily.

Alberta will take slightly less oil in April, asking for 41,258 bbl. daily. British Columbia refiners will take slightly more, seeking 67,700 bbl. daily. Saskatchewan take will be lower at 40,900 bbl. daily; and Manitoba will take 13,665 in April, compared to 15,245 in March.

The Puget Sound area of the U. S. is seeking about 12,000 bbl. daily more in asking for 55,600 bbl. The U. S. Great Lakes area request is down to 14,700 bbl. daily, from 20,600 bbl.

Who gets what ... Imperial Oil, Ltd., will purchase nearly one-third of all the crude in April, 100,400 bbl. daily. British Columbia Oil Co., Ltd., is next with 50,515 bbl., and Texaco Exploration Co. is third with 38,500 bbl. daily.

Other refiners to take more than 10,000 bbl. daily of Alberta oil include: Shell Oil Co. of Canada, Ltd., 34,300; Mobil Oil Co., 24,000; Consumer's Co-Operative Refiners, 13,700; North Star Oil, Ltd., 11,500; and Cities Service Refining (Canada), Ltd., 10,000.

Some of these purchases are by Canadian companies for their parent companies in the U. S.

Truer Nominations

. . . expected in Louisiana by conservation official.

LOUISIANA'S first test of its plan to close the 100,000-bbl. gap between purchaser nominations and actual purchases of crude will occur this week at New Orleans (OGJ, Feb. 22, p. 75).

Conservation Commissioner Ashton Mouton said he is expecting full cooperation from refiners in complying with his recommendation that nominations include the amount of crude and condensate obtained from all sources—not just from fields for which they nominate.

In this manner, the Conservation Department can determine why purchases of some 100,000 bbl. daily have not been nominated by buyers from specific fields in the past.

The allowable hearing will be held April 12, in the Wild Life and Fisheries Building at New Orleans.

Mouton has set the quarterly natural-gas allowable for April-June at 9.8 billion cubic feet daily, compared with 10.1 billion for the January-March quarter.

The reduction, Mouton said, reflects the seasonal drop in gas demand, as reported by the industry.

Meanwhile, Louisiana's State Mineral Board, which handles leasing of state lands, will meet April 28 instead of April 21. The meeting will be the last one under the administration of Gov. Earl K. Long.

Foreign Depletion Attacked

SEN. JOSEPH C. O'Mahoney (D-Wyo.) thinks percentage depletion should be ended on overseas operations.

He revealed that he had expressed this view to the National Petroleum Council at the council's recent meeting in Washington.

O'Mahoney gave two reasons. He cited this Government's growing need for tax money and argued that the tax incentive applied abroad simply further increases the cost advantage foreign oil already has over domestic crude.

Jake Hamon, Texas independent, offered a rebuttal at the NPC meeting. He to'd O'Mahoney there are tremendous risks in foreign oil exploration and development and the national defense position would be weakened if incentive to U. S. companies to develop oil abroad was reduced.

O'Mahoney's remarks stirred fresh speculation that the next vigorous attack in Congress on percentage depletion probably will be aimed primarily at foreign depletion. The issue is almost certain to crop up, at least in the Senate, before this session of Congress ends.

Houston Firm Sold

. . . to TGT for $17 million in stock-exchange deal.

FIFTEEN Oil Co., organized in 1937 by 15 Houston oil men, will turn over all its assets shortly to Tennessee Gas Transmission Co. in exchange for stock valued at about $17.4 million.

The deal is subject to approval of holders of 80% of Fifteen Oil's stock at a meeting in Houston April 19.

Tennessee Gas is expected to merge most of Fifteen Oil's operations into a Louisiana division.

Fifteen Oil has a gross daily crude production of about 3,500 to 4,000 bbl. and a net production of about 2,500 to 3,000 bbl. Gross gas production is about 10 to 12 million cubic feet daily and the net about 5 to 7 million. Ninety per cent of the production is in South Louisiana and the remainder in Boling Dome field, Texas Gulf Coast.

Stockholders will receive 477,092 shares of Tennessee Gas stock for their holdings. The Tennessee Gas stock last week was selling for $36.50 per share.

Dixon H. Cain, president of Fifteen Oil will continue in the oil business in Houston and be joined by John T. Lochridge, vice president in charge of geological exploration. Ben H. Freeman, superintendent at Layfayette, La., will become a consultant at Lafayette.

Oil's TBA Rebuttals Due

MAJOR OIL companies accused of pressuring service stations to handle certain brands of tires, batteries, and accessories will soon get their inning before a House subcommittee.

Rep. James Roosevelt, (D-Calif.) announced that his subcommittee would hear company spokesmen April 20 and 21. These hearings will be a follow-up of December hearings at which service station dealers and others testified they were pressured by suppliers to stock certain brands of TBA items.

Some company representatives, feeling that Roosevelt already has his mind made up, suspect that the congressman isn't so interested in hearing their side of the subject as in getting an opportunity to harass them further.

Low-Cost Controller

. . . regulates power-level at Shell pump station.

A FULLY automatic power-level controller that operates independently at each pump station and without a communications system has proved to be a money saver for Shell Pipe Line Corp.

The automatic device, after a 5-month test period, has shown it can perform most of the same functions accomplished by more elaborate and expensive automatic control systems, Shell reports.

The controller device readjusts itself to the next higher or lower horsepower level, depending on the hydraulic conditions in the stream. It monitors the suction pressure, case pressure, and pressure being throttled by the station throttle valve.

Ten horsepower combinations are available to the device which seeks its own optimum horsepower level without manual assistance.

Southwestern Industrial Electronics Co. designed and manufactured the instrument under Shell license.

Shell said the ability of the controller to function automatically and independently eliminates troubles from communications failures, faulty operations resulting from spurious signals, and excessive physical burden on the central operator.

After extensive shop testing, the controller was installed at a Grand Lake, Okla., pump station on the Ozark Pipe Line System operated by Shell.

Wild Louisiana Well Killed

BY USING a directional relief well, Union Producing Co. has won its battle to kill the gas flow of a wild South Louisiana dual producer and is now preparing to shut off salt water flow from another sand.

For nearly 2½ months the Deer Island field well in Terrebonne Parish blazed away while Continental Drilling Co., the contractor, sank the relief well (OGJ, Jan. 18, p. 51, and Mar. 7, p. 63).

At 11,700 ft., the operators pumped water and mud into the gas formation, choked off the gas flow, and killed the fire. Last week the relief well was headed vertically to 12,100 ft. into the oil sand, where water and then heavy mud will be pumped to bring the well under full control.

Union Producing expects to move a rig onto the original hole and recomplete the well. It also expects to complete the relief well.

Methane Plant Planned in Algeria

● Details of just where methane will be sold have not been revealed, but an agreement has been made to build a plant to process Hassi R'Mel gas.

THE MASSIVE natural-gas reserves of the Sahara desert's big Hassi R'Mel field moved a step nearer Europe last week with the disclosure of a new U. S.-British-Dutch-French company which will build a liquefied methane plant on the North African coast.

No firm contracts have yet been signed, but the preliminary details have been ironed out. The new company Cie. Algierienne due Methane Liquid (Camel) will be a joint venture involving the French discoverers of the big gas deposit, the American inovators of the liquefaction transportation process, and French banking interests.

The varied interests involved are now talking in terms of an output of from 50,000 M.c.f. to 100,000 M.c.f. daily from the plant, which will be built at Arzeu near Oran on the northwestern Algerian coast. Gas throughput of the proposed plant will come from a 24-in. gas pipeline already under construction from the Hassi R'Mel field to the Mediterranean coast of Algeria.

Who is involved . . . Conch International Methane, Ltd., successor to the original Constock Liquefied Methane Co., will have a 50% interest in the new venture. Until the Royal Dutch-Shell interests bought into this firm in January of this year, it was owned by Continental Oil and Union Stockyards of Chicago.

The original Continental - Union Stockyards firm did the research and experimental work that led up to the seven successful voyages of the Methane Pioneer, delivering Louisiana gas to Great Britain's North Thames Gas Board.

The French Partners in the new venture will be SN Repal, the French government-controlled company which discovered the gas reserve, and Cie. Francaise de Petrol (Algerie) with 26% of the venture divided between them.

A group of French banking interests have formed Soc. Algerie de Development to hold a minority interest in the new venture along with a 7% interest to be held by Air Liquide, a French chemical company. The official French government agency, Bureau de Recherches de Petrole, will have an interest also.

What is involved . . . The new company will build a plant to refrigerate natural gas to a liquid state at a minus 258° F. so it may be transported in insulated tankers. Top markets for such gas are in Europe.

After the French tapped the now estimated 30 trillion cubic feet gas reserve at Hassi R'Mel, the big problem has been in finding a way to utilize the big energy reserve.

Plans are being considered to build pipelines across the Mediterranean to move the gas supply to its logical European markets. The big hitch so far has been in licking the problem of building an operative submarine pipeline which could be laid in the water depths encountered in the Mediterranean crossings proposed.

The liquefaction plant and tanker transport are the alternative solutions for moving the gas. Conch International has made this preliminary agreement to build a liquefaction plant, but so far nothing has been said about building big tankers which could carry a volume of liquefied gas—and which would make such an operation an economic success.

Venezuela Not Quite in Oil Business—Yet

JUAN Pablo Perez Alfonzo, Venezuelan minister of mines and hydrocarbons, last week denied that the new Venezuelan government oil company is preparing to start drilling in the immediate future.

In a telephone interview with The Oil and Gas Journal, Perez Alfonzo said that disclosure of plans for drilling are "premature." Personnel who will operate the new government company have not yet been named, he said.

There had been reports in the industry that bids were being sought from contractors for drilling the first wells for the government firm. Reports were that the first well would be drilled on government acreage in Lake Maracaibo near Shell and Mene Grande.

Organization of the company is complete, Perez Alfonzo said, except for appointment of personnel. This will be done, he said, in "the next 2 or 3 weeks."

Caltex Hits Again in Sumatra

CALTEX may have another field in the making in its prolific concession area in Central Sumatra.

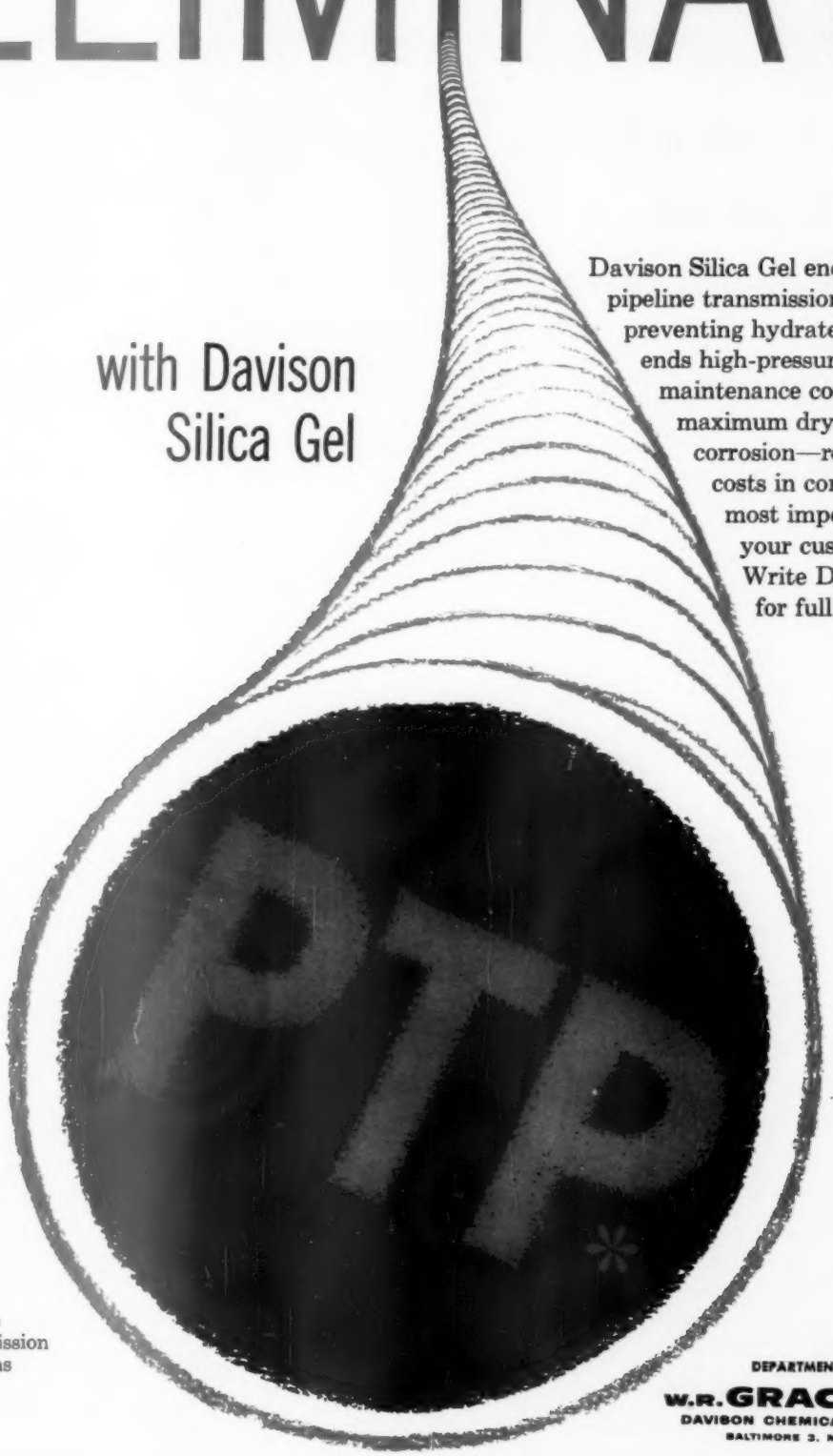
Amoseas, the exploration company for the Texaco - California Standard group, calls a wildcat find at Pematang "significant," but will give no details. The discovery is 43 miles northwest of the center of sprawling Minas field.

Caltex produces 150,000 bbl. daily from Minas, and another 20,000 to 30,000 bbl. daily from Duri field, 46 miles to the north and slightly to the east. Three smaller fields in the vicinity, Bekasap, Pungut, and Sebanga, are shut in.

Minas crude is now carried out through a 26 and 30-in. pipeline to Duri, where the line ties into a 30-mile 30-in. flowline carrying crude to a 2-year-old ocean terminal on the East Coast. A 12-in. pipeline, which formerly carried Minas crude to a river terminal on Siak River, is still in existence, but is out of service.

ELIMINATE

with Davison Silica Gel



Davison Silica Gel ends natural gas pipeline transmission problems. By preventing hydrate formation, it ends high-pressure losses—lowers maintenance costs. By providing maximum dryness, it decreases corrosion—reduces power costs in compression—and, most important, keeps your customers happy. Write Dept. 3104 today for full information.

* Pipeline Transmission Problems

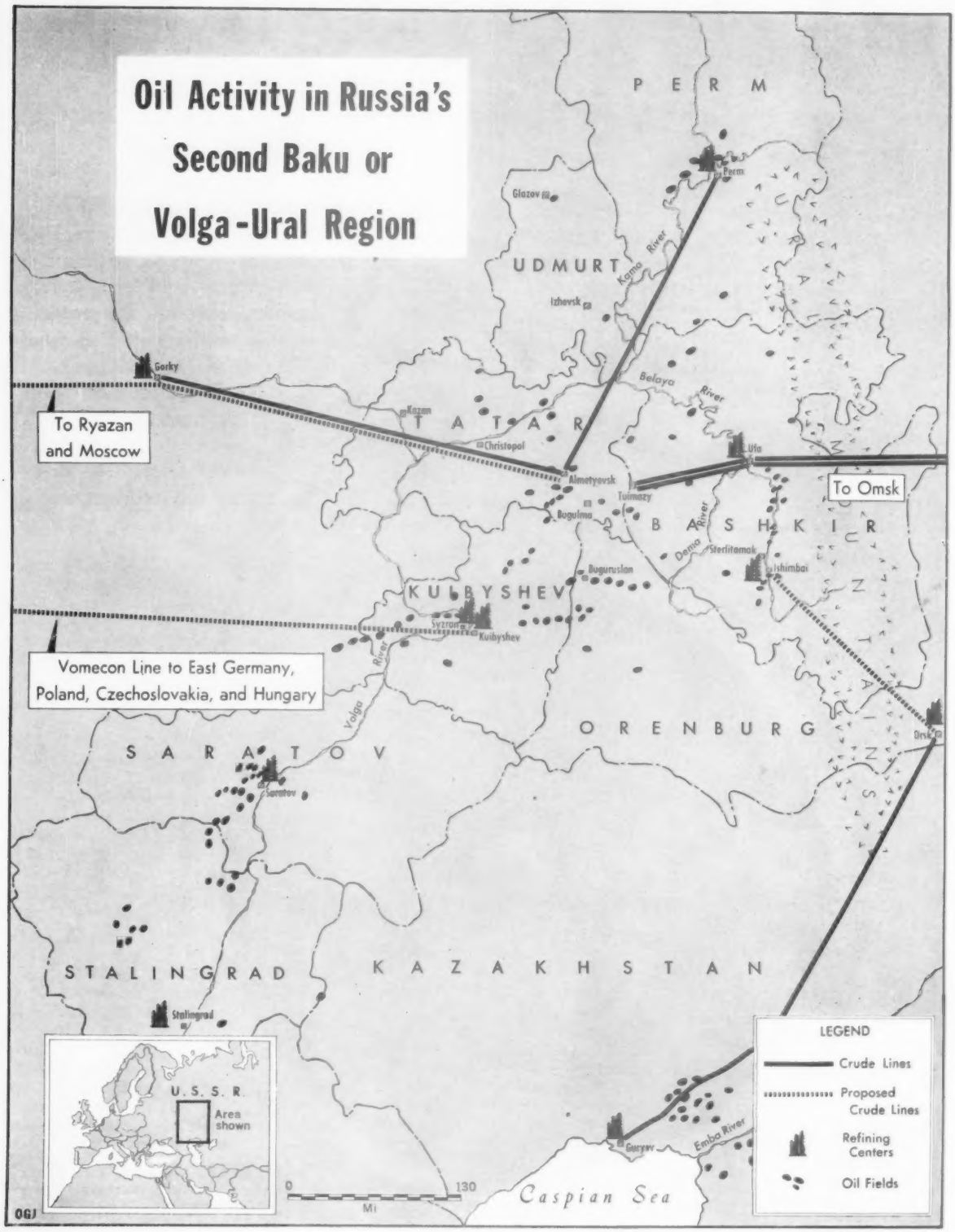
DEPARTMENT 3104

W.R. GRACE & CO.

DAVISON CHEMICAL DIVISION

BALTIMORE 3, MARYLAND

Second Baku Is the Big Bear in Soviet



Oil Production, and It's Still Growing

• This bigger-than-Texas region will provide Russia with about 75% of her production in the early 1960's. If development follows plans now in the mill, Second Baku may beef up Russia's production to the point that the country will edge Venezuela as the world's second largest producing nation.

RUSSIA'S Second Baku has come into its own as the Soviet Union's dominant crude-producing area, and it is now one of the most important oil patches in the world.

The region, between the Volga River and the Ural Mountains, will supply a record share of Soviet oil this year, despite Russia's long-range plans to diversify its sources of crude.

Soaring output from eight provinces comprising the Second Baku will account for more than 115 million of the 144 million metric tons of expected production. This will be more than 2,300,000 bbl. daily out of about 2,880,000 bbl. daily.

Probably little, if any, of the crude competes directly in free-world markets at the present time. But it undoubtedly will within a matter of years when a proposed pipeline outlet is built to the Baltic Sea.

Second Baku crude already has an indirect influence on world trade. It is freeing supplies from old Baku and other areas suitably located for exports.

These exports rose 40% last year to 500,000 bbl. daily. More than half of this was sold or bartered in free-world markets.

Output concentrated . . . The combined area of the eight producing provinces and autonomous republics in the Volga-Ural region is slightly larger than Texas. But the Russian producing industry is concentrated even more heavily in Second Baku than the American industry is in Texas.

Texas, for example, has nearly 9% of the U. S. continental land area, and provides about 38% of American production. The Volga-Ural region comprises 3% of the USSR land mass, and will provide about 75% of the Soviet crude output during the early 1960's.

Three individual Second Baku areas have passed old Baku in importance. These are Tatar and Bashkir Autonomous Republics, and Kuibyshev Province. Other productive areas are Udmurt Autonomous Republic and Perm Province, in the northern part of the region. Orenburg, Saratov, and Stalingrad Provinces are productive in the southern and western part of the area.

Important discoveries were made last year in Kuibyshev and Perm Provinces, and in northwest Bashkir. Other finds also were made in the far-northern Pechora field area, east of Ukhta, and in the Grozny, Melgobek, and Daghestan field areas north of the Caucasus Mountains, near the Caspian Sea.

Output grows . . . The Russian Republic, with production from Second Baku, in 1940 produced about 140,000 bbl. daily, less than one-fourth of total Soviet output. In 1950, the region accounted for less than half of USSR production.

Since then, Second Baku has pushed old Baku, in Azerbaijan, well into second place, despite extension of production into offshore areas of the Caspian Sea. Azerbaijan in 1940 produced about 445,000 bbl. daily, or 71.4% of total production. This year it will average about 355,000 bbl. daily, less than one-eighth of Soviet output.

The third-ranking Soviet area is Turkmenia, where fields across the Caspian Sea from old Baku are scheduled to produce about 99,000 bbl. daily this year. Ukrainian output is expected to average 42,000 bbl. daily. Kazakh output will reach 32,000 bbl. daily, Uzbek, 32,000 bbl. daily, and Kirghiz, 9,000 bbl. daily. Small output also will come from Tadzhik and Georgian Republics.

Several important oil discoveries were made outside Second Baku last year. These included finds at Kagan in Uzbekistan, at Kamyshldzha in western Turkmenia, and at Gnedintsevsk in Cherigov Province of Ukraine.

The Soviet minister of geology has called the Turkmenia and Uzbekistan discoveries among the richest in the Soviet Union. He predicts the area will have a producing potential equal to the Middle East. Turkmenia and Uzbekistan are adjoining territories. While Turkmenia is bordered on the west by the Caspian Sea, it also has good oil country lying to the south, Iran.

Significant production still eludes Siberia. The huge region is twice the size of the continental U. S., and comprises 70% of the Soviet Union's territory.

There has been some promise in this huge area, however. Oil and gas finds have been reported in the Berezovo region of Siberia, near Ob River. A gas find also has been reported in the Osa River Valley, about 93 miles north of Irkutsk, in Eastern Siberia.

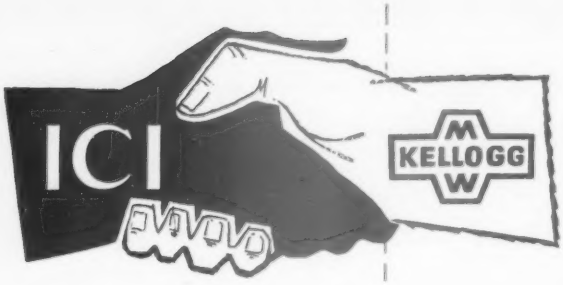
Pipeline program . . . Construction of crude, gas, and products pipelines are going ahead at a record pace, despite a shortage of pipe for some projects. Out of 3,550 miles of pipeline scheduled for construction this year, 1,277 miles will consist of crude and products lines.

The most important project is further progress on a 2,300-mile 28-in. crude carrying system from Second Baku into Siberia. It will eventually carry crude from Tuimazy fields to Irkutsk, on Lake Baykal.

Another system now under construction will carry crude from the Volga-Ural area into Eastern Europe starting in 1962. One branch will feed refineries in Poland and East Germany. Another section will supply Czechoslovakia and Hungary. The 2,500-mile line, known as the Vomecon system, is expected to deliver about 300,000 bbl. daily.

Outlook . . . The production goal of 2,880,000 bbl. daily this year will put Russia in the same class as Venezuela as an oil producer. It may be enough for the Soviets to edge out the big Latin American producer as the world's second ranking oil country.

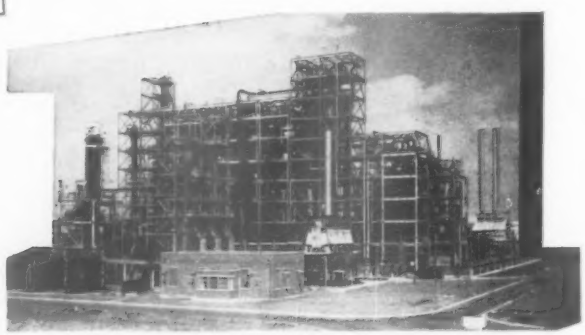
Exports are scheduled to rise further from the 500,000 bbl. daily level of last year. But local production also has an expanding domestic market. Oil and gas this year will capture about 38.7% of the total Russian fuel market, up from 35.3% last year. Most of the gain will be made at the expense of coal.



KELLOGG BUILDS FOR I.C.I. EXPANSION

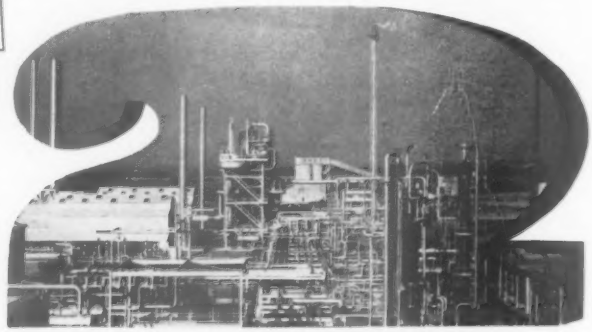
1951

Recent completion of Imperial Chemical Industries' third olefin plant at Wilton, England, has made these Works the largest petrochemical venture outside the United States. With a current output of 110,000 tons per year of high-purity ethylene, and a potential output of 140,000 tons, I.C.I. Wilton is an outstanding example of engineering cooperation.



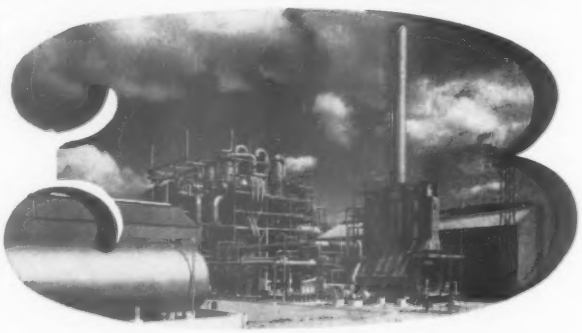
1956

The first plant was commissioned in 1951, and was the first full-scale adoption of the then novel process of oil pyrolysis developed in the Kellogg Laboratories. Its success led to the addition of No. 2 plant in 1956, and then to this latest extension, representing a 60% increase in olefin capacity, in 1959.



1959

Cooperation between client and contractor is the keynote of Kellogg's contribution to chemical engineering. The Wilton Olefin Plant is the largest in the world based on liquid feedstock. Kellogg is proud to have been associated with its development.



To learn more about Kellogg's background in engineering and building olefin plants, at home and overseas, write for current Kelloggram

THE M. W. KELLOGG COMPANY

711 Third Avenue, New York 17, N. Y. *A Subsidiary of Pullman Incorporated*

Offices of Kellogg subsidiary companies are in Toronto, London, Paris, Buenos Aires, Rio de Janeiro and Caracas

New Petrochemical Units Planned for Europe

- **Most of the work will be in the U. K. Outside Europe, plants are scheduled for Argentina and Japan.**

PETROCHEMICAL growth in Europe will be given another boost by construction planned in the United Kingdom, Netherlands, and Denmark.

Most of the expansion is planned by British companies, with projects scheduled for Scotland and Wales, as well as England. This is in line with a continuing boom during which petrochemical production has doubled in the U.K. in the last 10 years.

However, new foreign petrochemical projects are not limited to Europe. Argentina and Japan are also to be the sites for new units.

British Hydrocarbon Chemicals, Ltd., owned jointly by British Petroleum and the Distillers Co., will build three plants near BP's 84,000-bbl. refinery at Grangemouth, Scotland.

One of the plants will more than double the company's existing capacity for the manufacture of butadiene, an important raw material for synthetic rubbers. Another plant will make methanol, used chiefly in the manufacture of formaldehyde. The third plant will produce ethylene dichloride, an important raw material for plastics.

The plants will take advantage of new facilities under construction at Grangemouth that will produce 70,000 tons of ethylene per year starting at mid-year. The three plants will cost a total of $14 million. They will go on stream in 1961.

British Hydrocarbons has just opened a new 13,000 tons per year synthetic phenol plant at Grangemouth. One of the two units of the plant produces cumene by reacting benzene with propylene. The second unit produces phenol and acetone from the cumene. The plant has been designed to produce a surplus of cumene, which will be exported.

British Geon, 55% owned by Distillers, and 45% by B. F. Goodrich Chemical, will build a $5.6-million polyvinyl chloride plant next to similar facilities at Barry, South Wales. The new unit will produce polyvinyl chloride polymers for sale to makers of various plastic products. It will open late next year.

The British subsidiary of Witco Chemical Co. expects to open a plant next year in the Midlands for the annual production of 4,000 tons of synthetic rubber latices. Output will include butadiene-styrene, high styrene, nitrile, and other acrylic latices.

Shell Chemical Co., Ltd., will build facilities at its Carrington chemical center for the manufacture of polydiene rubbers. The plant will be able to produce either polybutadiene or polyisoprene, depending on market conditions. The plant will open in 2 to 3 years.

Holland, Denmark . . . Royal Dutch-Shell plans to build a similar plant in the Netherlands. The facilities will make polybutadiene and polyisoprene available commercially for the first time in Europe.

Two companies, Commercial Plastics, of London, and N. V. Boekelosche Stoombleekerij, of Boekelo, Netherlands, are setting up a joint firm for the manufacture of adhesive plastics and other products. The new company will be called Boekelo Plastics N.V.

Two Danish firms and a British company plan to organize a joint company for the manufacture of polyolefins in Denmark. A new 15,000 tons per year plant will be built at existing facilities at Maersk, owned by the Danish partners, Dampskibsselskabet Svenborg and Dampskibsselskabet af 1912.

The British partner will be Imperial Chemical Industries, whose "Alkathene" brand polythene will be produced by a high-pressure process.

Argentina, Japan . . . Among the new foreign projects in other quarters is a jointly owned phenol plant in Argentina to be built by the U. S.-based Hooker Chemical Corp. and a local Argentine corporation, Atanor, Cia. Nacional para la Industria Quimica, S.A.M.

The partners have set up a new company, Duranor, Industrias Quimicas Soc. Anon. Industrial y Comercial, for the project. But work cannot go ahead until a loan is negotiated with the Export-Import Bank for purchase of equipment in the U. S.

Plans call for facilities to produce 25 tons per day of phenol by a newly developed Hooker process. Construction is expected to start about July, with completion in less than 2 years. The plant will be built at one of Atanor's two existing plant locations.

Hooker initially has a minority interest in the venture, with an option to acquire up to 50% ownership within a year after approval of the bank loan.

In Japan, Stone & Webster Engineering will design and help engineer and construct a second ethylene plant for Mitsubishi Petrochemical Co. The plant will be located at Yokkaichi, near the port of Nagoya. It is scheduled for completion in 1961.

Argentine Line in Service

YPF HAS inaugurated the first of a pair of twin lines that will carry products and natural gas from Salta fields in northern Argentina.

President Arturo Frondizi was on hand for the opening of the 920-mile 12-in. section, which will move products to a terminal at San Lorenzo refinery, on the Parana River. The line will carry almost 58,000 bbl. daily when all pumping stations and a new gasoline plant are completed later this year.

Pipe has ben laid on a 22 and 24-in. line and several pump stations are nearing completion. The line is continuing beyond San Lorenzo to Buenos Aires, for a total length of 1,100 miles. It will move 243,000 M.c.f. daily.

The $200 million project is probably the first in which a long distance products line and a natural-gas line have been laid side by side. Both lines will be fed from a single gasoline plant, which will process gas condensate production from the Campo Duran and Madrejones areas.

Design capacity of the products line is 57,864 bbl. daily. The chief product will be 34,342 bbl. daily of 52°-gravity distillate, some of which is produced from Madrejones wells on the Bolivian side of the border.

Proposed deliveries of other products include 4,088 bbl. daily of propane, 4,151 bbl. of butane, 7,673 bbl. of gasoline, 3,113 bbl. of kerosine, and 4,497 bbl. of gas oil and diesel oil. Until the new processing plant is completed, the products will be taken from a temporary plant at Campo Duran. Fish International Corp. is in charge of engineering and is supervising construction.

Guatemala Test Due

. . . by Ohio Oil after first deep wildcat abandoned.

DRILLING problems have caused the abandonment of a deep wildcat in northern Guatemala and the rig is being shifted 17 miles to the northwest for a new test.

Ohio Oil Co. of Guatemala, operator for a four-company group, gave up on the Chinaja wildcat after high pressure, corrosive sulfur water flow, and periodic lost circulation caused the drill pipe to part three times in 8 months.

The straw that broke the back of the jungle well was a break in which 38 joints of pipe weighing 25,000 lb. dropped 2,400 ft. to the bottom of the hole. This made recovery economically unfeasible. Final depth of the well was 10,806 ft.

Small amounts of crude were recovered last July, but production was noncommercial. The oil samples were the first ever produced in Guatemala.

A road is now being cut to the new location. The first well was 110 miles from the coast. Ohio Oil's partners in the program are Amerada Petroleum, Continental Oil, and Union Oil Co. of California.

Danish Refinery Contracted

CONSTRUCTION contracts for Tidewater Oil Co.'s new Danish refinery have been awarded to two firms, Foster Wheeler, Ltd., London, and Soc. Fives-Penhoet, Paris.

Preliminary engineering has already started on the 20,000-bbl. plant, which will be the first in Denmark. The refinery is being built on a 550-acre site at Kalundborg. It is scheduled to go on stream September 1, 1961.

Tidewater's local affiliate, Dansk Veedol, will spend $24.3 million in Scandinavia in the next 2 years on the refinery and related projects. Marketing terminals for the refinery's products are under construction in Norway and Sweden.

Plant design will permit expansion to 40,000-bbl. daily.

Reds Sell Equipment

. . . to UAR and Ethiopia in drive for bigger market.

RUSSIA and Romania are stepping up deliveries of oil-field and refining equipment both to satellite and free-world countries.

Among the latest moves is an agreement with Ethiopia under which Russia will supply economic and technical help for a refinery project in the African kingdom. The size and construction schedule for the plant were not revealed.

In another deal, Russian engineers are designing a diesel-powered vessel for seismic work in coastal areas of the Mediterranean and Red seas for the United Arab Republic. The ship will be launched next year.

Equipment factories at Baku have sharply stepped up shipments of oil-field gear to Afghanistan. Some deliveries were made early to coincide with the visit to Kabul by Premier Khrushchev. Shipments included two 135-ft. derricks, electric motors, bits, and drilling mud.

Romania says it recently delivered 120 rigs to Communist China. Size of the rigs was not disclosed. Another 46 rigs were delivered to Russia, East Germany, Czechoslovakia, Poland, and other countries last year.

French Deal Made

. . . between government, Esso for coastal tract.

THE FRENCH government-controlled Cie. D'Exploration Petroliere has entered into a joint venture agreement with Esso Rep for operations covering CEP's 1,785 sq. km. (about 689 sq. miles) Camargue permit in southern France.

The Esso agreement is similar to previous deals made by American and French companies. Esso will reimburse CEP for previous exploratory costs. CEP has held the license since 1949 and found one small two-well field, Gallician, which produces about 11 bbl. daily.

Esso Rep, along with several other companies, has applied for a much bigger block of acreage north and northwest of the CEP Camargue permit. In addition Esso Rep and CEP have made joint applications for Paris basin acreage recently released by RAP, another government-controlled French company.

The Camargue license involved in the new Esso-CEP agreement is west of Marseilles along the French Mediterranean coast.

FOREIGN BRIEFS . . .

The third wildcat in a drilling program on Timor will be started as soon as the monsoon season ends in a few weeks. Tradewinds Exploration, Inc., partially owned by Sunset International Petroleum Corp., has half interest in concession over the 7,000 sq. miles of the Portuguese side of the island located off northwest Australia.

An ammonia and nitric acid plant will be constructed by International Petroleum (Columbia) Ltd. at Cartagena. The new $13,000,000 facility will use gas from the IPC refinery there, supplemented by naptha, for raw materials.

Japanese money will build Singapore's first refinery. The former British crown colony which now governs itself has leased a site for a 20,000-bbl. refinery to a group headed by Maruzen Oil Co.

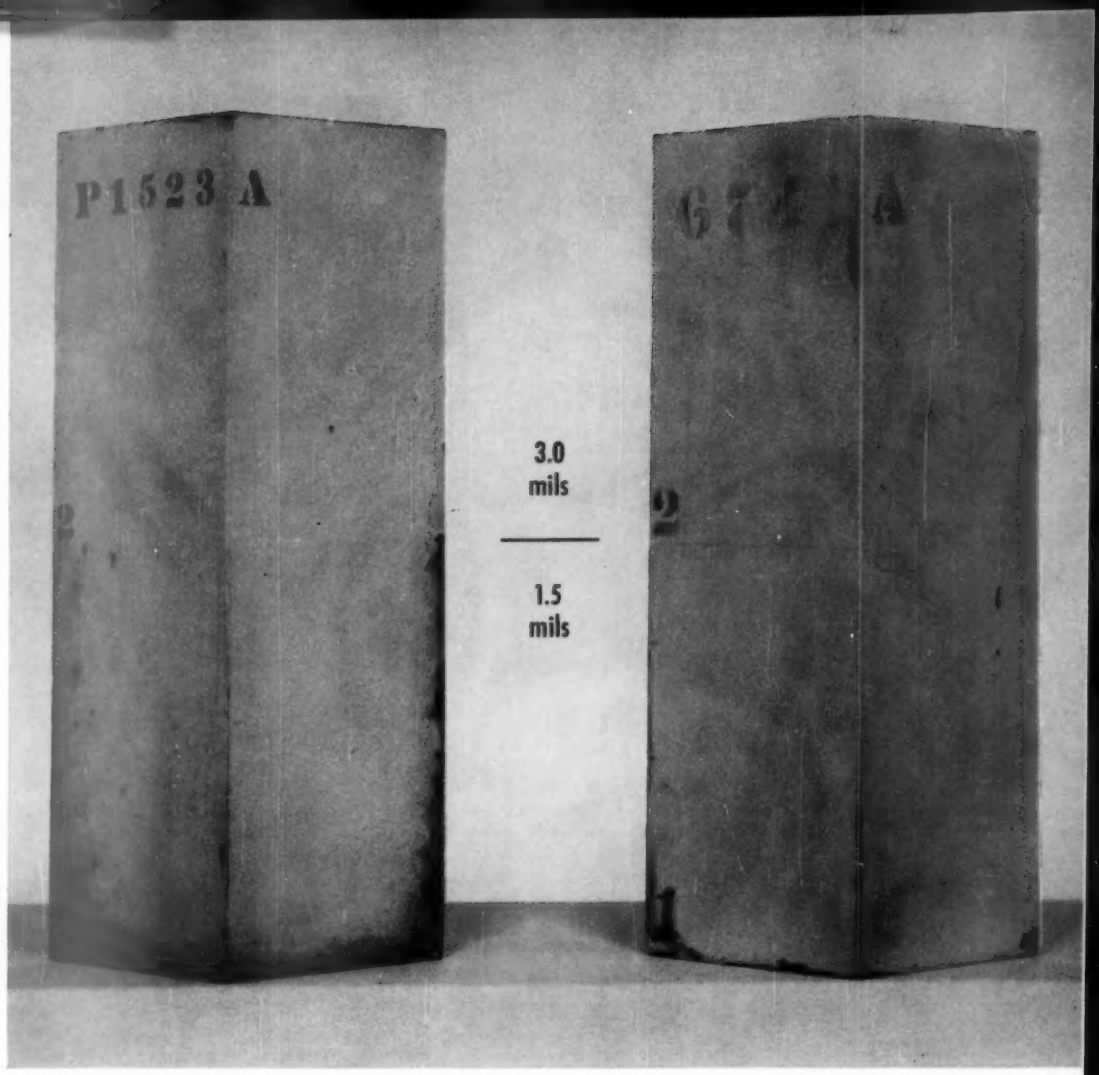
The agreement is for 30 years with the first 5-year period to be tax exempt. Construction will begin in June 1961 and be completed before the end of that year.

Union Chimique Belge, S. A., Brussels, is building a new 5,000-metric-ton per year phthalic anhydride plant at Schoonarde for an estimated cost of $2,000,000. Badger N. V. will handle the design, engineering, and construction.

"Encouraging gas production" has been found in the Irrawaddy River Delta by Burma Oil Co. (1954), Ltd. The company says it is too early to tell whether the discovery at Payagon is commercial. No oil has been recovered from the well. The wildcat was bottomed late last year at 13,108 ft., making it the deepest well in Burma. Depth of the gas producing zone has not been revealed. The well is located southwest of Rangoon.

Cities Service is acquiring one-third stock interest in a large independent marketer in Italy. The deal with ABC-Petrolifera Italiana, S.P.A., will give Cities Service an important outlet in one of Europe's fastest growing markets. It also will help finance expansion of the marketing company in Italy and Sicily.

Gas has started flowing through the final link of a new Russian pipeline from Karadag field, on the Caspian Sea, to the capitals of Georgia and Armenia.



Never before such durable protection, never before such lasting appearance in metal protective paints.

Proof anti-corrosion finish paints made with M50® pigment give unique freedom from bilging

Compare ... for color ... the gray alkyd finishes on the two exposure test angles shown above.

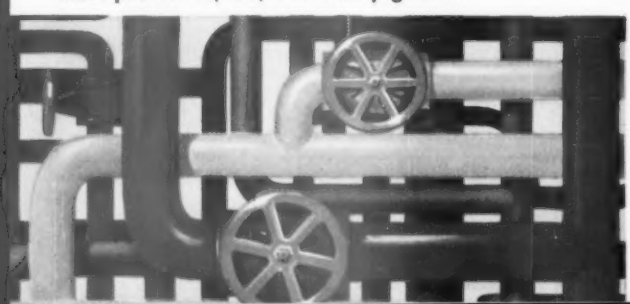
By all previous concepts for anti-corrosion paints, the one on the left should be the darker, should show some splotchiness . . . even though the paint on both angles came out of the same can. That's because the angle on the left was exposed (four years, 45°S) to the heavily sulfur-laden industrial atmosphere of Perth Amboy, N. J., while the angle on the right was exposed (four years, 45°S) only to the normal atmosphere found at National Lead's Sayville, L. I. Test Station.

As you can see, the color difference . . . bilging . . . that you might expect from SO_2-caused precipitation simply has not developed in this paint made with *M50* pigment.

Combined with its unique resistance to discoloration by the chemicals found in industrial atmospheres, fused M50 basic lead silico chromate pigment demonstrates exceptional rust inhibitive action.

Now, with *M50* pigment, your regular paint suppliers can provide standard or deep-coat anti-corrosion primers, intermediates and finishes with superior rust inhibition, superior weather resistance, and excellent tintability. Paints that are more durable and don't bilge. The *M50* pigment is suitable for use with a wide variety of vehicles.

Color code paints look better longer, are more protective, too, with M50 pigment.

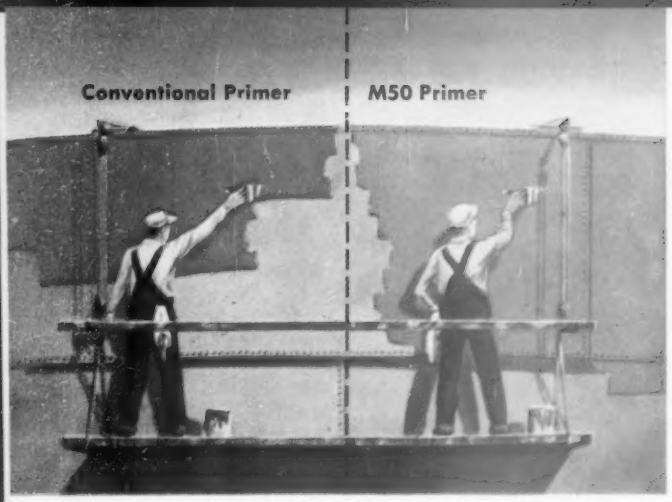


See, on the next page, more details... and how you can get these new, much more durable anti-corrosion paints.

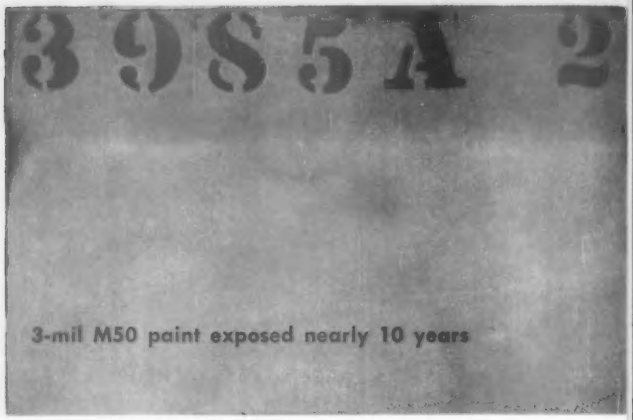
M50 an **oncor** *pigment development of*

National Lead Company

111 Broadway, New York 6, N. Y.



Weight for weight, anti-corrosion paints made with high-bulking M50 pigment cover 40% to 60% more steel.



Mil for mil, M50 paint films show better rust-inhibitive performance, lengthen the painting cycle interval.

Here's evidence M50 pigment paints reduce anti-corrosion maintenance painting costs two ways

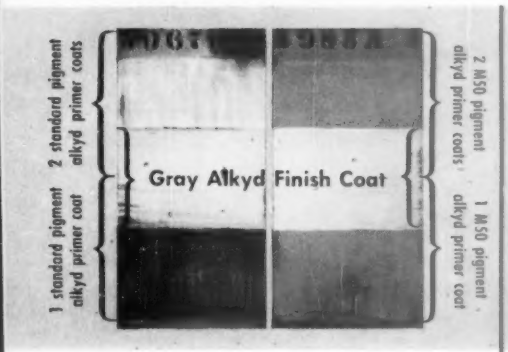
On the preceding page you have seen evidence that *M50* pigment paints are unique among anti-corrosion paints for anti-bilging properties. Exposure tests at National Lead's Sayville, L. I. Test Station have demonstrated these metal-protective paints are also unique for their anti-corrosion action, their weather-resistance, their color stability and many other performance characteristics.

Above you see evidence that *M50* pigment paints are equally unique in their ability to provide anti-corrosion maintenance painting economy. The illustration at left gives you a visual comparison between the coverage of a conventional anti-corrosion primer and an equal weight of an *M50* counterpart of this same primer (Fed. Spec. TT-P-86a, Type I). Clearly a given weight of *M50* pigment paint goes further.

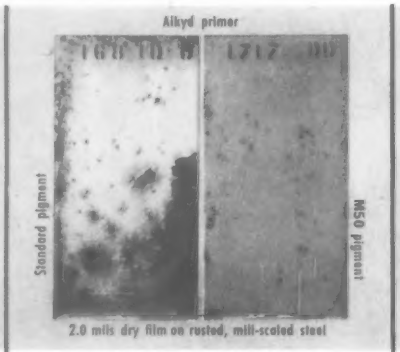
The picture at the right shows the condition of a 3-mil *M50* pigment *primer* exposed nearly 10 years *without a finish coat.* You can see that even in this severe test . . . an unprotected primer . . . anti-corrosion action is still being obtained. The repainting surface is still in good shape. Weather has not adversely affected protection. Imagine how many years of service you can anticipate from anti-corrosion *M50* finish coats applied over anti-corrosion *M50* primers in the normal or deep-coat systems!

Based on cost per sq ft per year, M50 pigment paints can greatly reduce the cost of your anti-corrosion maintenance painting.

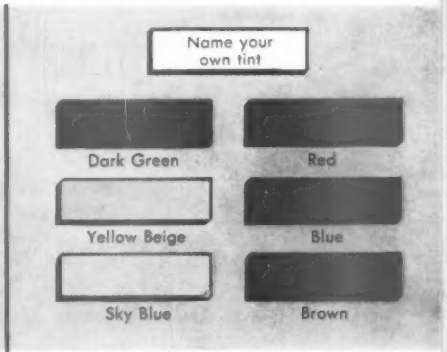
Why M50 Defense in Depth paints give anti-corrosion beyond all former concepts


2 standard pigment alkyd primer coats
1 standard pigment alkyd primer coat
Gray Alkyd Finish Coat
2 M50 pigment alkyd primer coats
1 M50 pigment alkyd primer coat

Exposed 9 years, 45°S. Each coat 1.5 mils
Proved corrosion and weather resistance



Exposed 45° S; 1 yr ind. atmos, 1 yr normal atmos.
Proved outstanding for film strength, durability



Colors above available in conventional and heavy-coat paints
A wide range of stable colors can be produced

Are you concerned with tank or structure maintenance painting in your firm? If so, you are invited: (1) to visit National Lead's Sayville, L.I. test station, where you will see the results of the 20 years research that lies behind the *M50* pigment particle and the more than 10 years of exposure testing that lies behind *M50* pigment Defense in Depth paints; (2) to send coupon below for National Lead booklet, "Defense in Depth" and typical *M50* tank paint specifications.

Next time you purchase, specify *M50* pigment paints. Any paint manufacturer can supply you.

M50 Defense in Depth

National Lead Company,
111 Broadway, New York 6, N. Y.

Gentlemen: Please send me the "Defense in Depth" booklet together with typical tank paint formulas and color chips that I can use in specifying M50-type tank paints.

oncor

Name_____ Title_____

Firm or Dept._____

Address_____

City_____ State_____

MAP of natural-gas and products pipelines of Campo Duran project.

THE CAMPO DURAN PROJECT of Yacimientos Petroliferos Fiscales (YPF) has a natural-gas line and a liquid-products line starting from a gasoline plant fed by wells in the Campo Duran and Madrejones fields in an area straddling the Argentine-Bolivian border northwest of Buenos Aires.

The 1,100-mile, 24-22-in. gas line having 36,000 compressor horsepower at four stations (with design maximum gas flow of 243,000 M.c.f.) extends from Campo Duran to Buenos Aires.

The 900-mile, 12-in. products line with 18,000 pump horsepower at nine stations (with maximum design capacity of 57,864 bbl. daily for moving propane, butane, gasoline, distillate, kerosine, and gas oil/diesel) extends from Campo Duran to San Lorenzo.

The gasoline plant at Campo Duran has been designed to have initial capacity of 282,515 M.c.f. extracting 37,000 bbl. of products daily.

YPF pipeline project is story of amazing logistics

BY PAUL REED
Pipeline Editor

THE CAMPO DURAN project in Argentina, now nearing completion for Yacimientos Petroliferos Fiscales (YPF), stands out among important projects of the world for several reasons.

Both the 1,100-mile 24 and 22-in. gas line and the 900-mile 12-in. products line rank among the world's major projects. Nowhere else have two such lines been built together as one project.

Probably this is the only case where a single gasoline plant feeds all shipments to large pipelines. Furthermore, it would be hard to find gasoline plants, such as the one being built at Campo Duran, which process seven finished products for delivery to markets along the route of a products pipeline terminating at a deepwater refinery. In addition to finished products, the products line makes large shipments of condensate designated as distillate.

The impact of this whole project with its capacity for daily delivering 243,000 M.c.f. of natural gas and 57,864 bbl. of liquid petroleum products promises to have far-reaching effects on the economy of Argentina. Benefits in sight have induced the investment of approximately $200,000,000 in the Campo Duran project.

Both lines have been laid. Construction of compressor and pump stations and gasoline plant will be completed in mid-1960.

The undertaking is being engineered and constructed for YPF by International Pipeline Constructors, S. A. (IPCO) who subcontracted various phases of the work to other companies. SARGO (S. A. Argentina Obras Oleoductos y Gasoductos) is handling all of the work on the project within Argentina from construction offices in Buenos Aires. Fish International Corp., Panama, is performing all engineering for the project and is responsible for supervision of construction. Fish staffed the SARGO organization with the necessary construction and supervisory personnel. IPCO subcontracted purchasing functions to NORICAN and NORCANSA for procurement and shipment of all materials and equipment outside of Argentina.

While this article deals principally with the facilities of the project—the "hardware"—the big story, an amazing story, is in the problems of logistics which make this undertaking entirely different from any other.

Logistics

The Campo Duran project is exceptional in the way financing, purchasing, and shipping have been carried out in a variety of currencies on four continents.

Any pipeline construction project is mostly a materials-handling job — a skillful, high-powered moving of tons of earth for ditching and backfilling

and tons of pipe for pipe laying.

The Campo Duran project had to start moving materials from points throughout the world, far in advance of work on the right-of-way and plant and station sites. The project had to apply methods for supply and transportation, resembling the logistics of major military undertakings.

Pipe, equipment, and materials came from unusual sources—some of which have not served pipeline projects before. The project even had to arrange for movement of some materials from one country to another for the consummation of fabrication. Furthermore, ocean and land transportation had to be planned and coordinated for moving everything to the job from four continents. Without adequate preliminary solution of international logistic problems, operations would have been complicated by various delays, and orderly effective construction would not have been possible.

Pipe for the products line was mostly made in Argentina. Shipments of 46,000 tons of plate for this operation from Germany, Austria, and Japan had to be coordinatetd to insure adequate pipe supply to work in the field.

Furthermore, some of the Japanese plate came to a United States pipe mill for fabrication of part of the 24-in. pipe for the gas line.

To insure uniformity of standards, the Fish organization sent a team of qualified people to Europe to assist pipe mills in setting up quality control and to see that requirements were met consistently.

Several European industries were set up to manufacture new types of equipment for the first time through American licensing and American techniques because of the Campo Duran project. These industries will continue to supply the pipeline industry.

Argentine shipping was used as much as possible. Deliveries came by ocean-going ships to the builder's depot at Rosario, upstream from Buenos Aires on the Rio Parana. From there material was transshipped by rail to job sites.

Even though transshipment was required from broad-gage to narrow-gage freight cars at Tucuman, it was advantageous to use the railroad as much as possible. Attention had to be given by the project engineers in calculating stresses of railroad bridges in preparing for shipment of heavy equipment.

The project shop at Rosario performed an important function in prefabrication of some of the facilities before delivery to the job site. For this purpose automatic-welding equipment was installed. Oxygen and acetylene were made, bottled, and shipped to the job—the largest operation of its kind in the country.

Project airplanes and VHF communication were vital for maintaining contact between the project management office in Buenos Aires and field operations, particularly since three postal strikes during construction virtually stopped normal mail and telegraph. Twice-weekly delivery of instructions, mail, and drawings were made by project planes which landed on special strips located on or near compressor and pump station sites.

Terrain

The project originates in the semi-tropical jungle area near the Bolivian-Argentine border at 1,600-ft. elevation. The two lines were laid approximately 50 ft. apart along the common right-of-way.

In the first half of the project, the route rises to more than 3,000 ft. elevation at two widely separate points, then dips and rises to another elevation of more than 2,600 ft. from which it slopes gradually via San Lorenzo to Buenos Aires at the coast.

Most of the construction was through semiarid country. In places at lower elevations cane fields were crossed where ditch had to be dug by backhoes. And there were swamp areas near San Lorenzo.

Natural-Gas-Transmission System

The 1,100-mile, 24 and 22-in. gas transmission line extends from the gasoline plant at Campo Duran to Buenos Aires. Significant features of the line are summarized as follows:

Compressor stations have been designed and constructed according to practices which have been well established in gas-transmission operations. Safety features and additional standby units exceed normal U. S. practice.

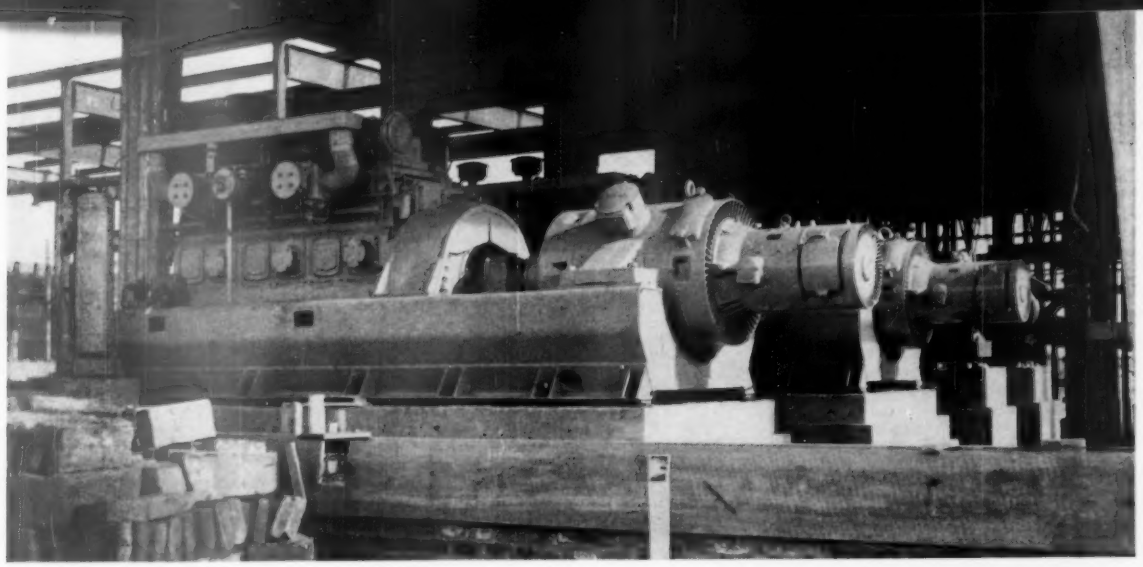
The four compressor stations on the gas-transmission system have a total of 18 Dujardin-Clark TLA-6 two-cycle compressor units. Each of these is of 2,000-hp. rating at 300 r.p.m. with six vertical in-line power cylinders driving three horizontal double-acting compressor cylinders as an operating unit having a common crankshaft. This engine design uses exhaust gas-driven turbocharger for the dual functions of scavenging and supercharging.

Two stations have five of these units, and two stations have four. One unit at each station is regarded as a standby.

These stations are designed to deliver 243,000,000 cu. ft. per day.

Design maximum gas flow and cor-

TRAILERS and portable buildings served personnel at camps along the two lines during construction.



CONCRETE AND BRICK masonry construction is used for products-line station buildings. Gas-line compressor stations are built of steel.

responding inlet and discharge pressure at each station are shown in Table 1.

Electric power at each station is provided by three generator units. Each unit has a four-cycle naturally aspirated spark-ignited gas engine driving a 152-kw. 760-r.p.m., 380-volt, 3-phase, 50-cycle electric generator.

Compressor station buildings are of steel construction.

The usual emergency shutdown and other safety features are included.

Gas Line

All pipe in the main gas pipeline is API 5LX with minimum yield strength of 52,000 psi. Wall thicknesses have been computed in accordance with ASA B 31 Gas Transmission Code, 1955 Edition, giving particular attention to population indexes for the areas traversed. Pipe data are given in Table 2.

The pipeline is of all-welded construction. It has been tested in accordance with ASA Code dealing with gas-transmission systems. A leakage test has been performed to assure that gas losses will be held to a minimum.

Valves

Main-line block valves at intervals of 15 to 20 miles throughout the entire route are Nordstrom 24 by 16 by 24-in. and 22 by 16 by 22-in., full-opening type.

These valves are manually operated except the gas-operated valves installed at three pressure-limiting stations. Gas-operated valves are set to close at specified pressures and to reopen at other set pressures.

Each pressure-limiting station has a split plunger relief valve installed for set pressures. The relief valve relieves the pipeline slightly below the maximum allowable working pressure of the pipe in the section immediately downstream. It closes when normal operating pressure is resumed.

If the relief valve should fail to close as anticipated, the gas-operated block valve (immediately upstream) will close to stop excessive gas loss.

Pressure-limiting stations with gas-operated block valves and relief valves are located where pipe of different wall thicknesses join, in accordance with the telescope type of line design required by YPF specifications. The pressure-limiting stations safeguard the thinner pipe.

Products Line

The products line is notable for being an unusually long, modern system for products entirely powered by engines.

While the entire products line consists of 900 miles of 12-in. pipe, only the 750 miles between Tucuman and San Lorenzo were laid as part of the current Campo Duran project. This section was completed in 1959. The remainder of the line was designed and built in a separate earlier undertaking.

The maximum design capacity of the system is 57,860 bbl. of liquids per day as detailed in Table 3.

TABLE 1—COMPRESSOR STATION FLOW AND PRESSURE CONDITIONS

	Design flow M.c.f.d.	Inlet pressure Psi.	Discharge pressure Psi.
Station 1	223,865	592	987
Station 2	195,564	681	890
Station 3	190,674	649	890
Station 4	144,065	727	727

TABLE 2—LINE-PIPE DATA

Length (miles	Diameter (in.)	Wall thickness (in.)
75	24	0.344
236	24	0.312
655	24	0.281
134	22	0.250

TABLE 3—PLANT PRODUCTS

Product	Volume bbl. per day
Propane	4,088
Butane	4,151
Gasoline	7,673
Distillate	34,342
Kerosine	3,113
Gas oil/diesel	4,497
	57,864

Deliveries will be made from heart cuts at eight storage and delivery stations equipped with tank and terminal facilities. Interfaces will be delivered at the San Lorenzo refinery.

Substantial deliveries of distillate and finished products will be made to the San Lorenzo refinery storage.

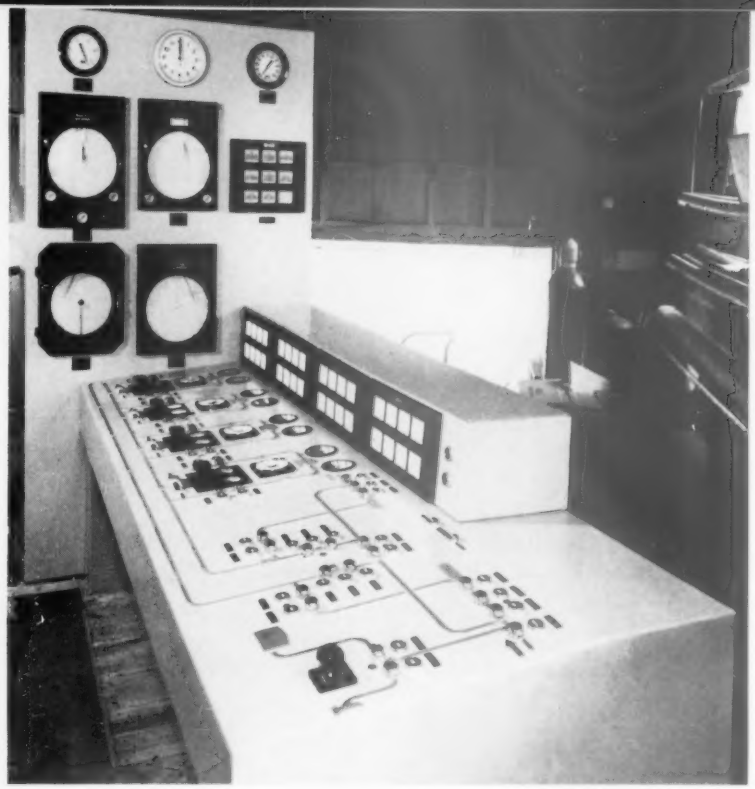
Data on significant features follows:

Pump Stations

There are nine pumping stations between Campo Duran and San Lorenzo. Each station has four pumping units—normally three active operating in series and one standby. At peak efficiency each station operated thus will move 2,420 bbl. per hour at 1,000 psi. station discharge.

Pressure load will be distributed among the three pumping units. Each station is designed to operate semi-automatically from a control console in the central control room.

Engines. Engines at the pump stations are all Deutz Model BWV 8M 536 (eight-cylinder, four-stroke) dual-fuel type, designed to operate either on diesel fuel or on a mixture of 90% natural gas and 10% diesel pilot fuel. Due to altitude, two stations are supercharged; the others are naturally aspirated. Engines are water cooled and started on compressed air. Devices provide for automatic shutdown for high jacket-water temperature and



CONTROL CONSOLE with panel-pane alarm indicators which are illuminated to show sources of trouble at each products pipeline station.

iow lube-oil pressure.

Should gas pressure drop to 17 psi., the engine will automatically switch over to full diesel operation. Normally these engines will develop 500 b.hp. at 500 r.p.m. capable of 10% overload rating for 1 out of 6 hours operation. Continuous operation may be maintained between 300 and 500 r.p.m.

Pumps. Pumps are Worthington Model 6 UNBS 13 heavy-duty two-stage pipeline centrifugal pumps with bronze impellers statically and diametrically balanced.

Speed increasers are Citroen 209-5C single-train pressure-lubricated herringbone type.

Compensating biasing regulators. A biasing regulator is included within each engine-speed control system. Each biasing regulator receives its signal from a common source which is a 1-to-1 pneumatic relay. This 1-to-1 relay selects signals fom either the suction or discharge pressure recorder or the flow recorder-controller. The biasing regulators then transmit signals to their respectively connected governors thereby effecting individual engine speed control. As a result of biasing, all of the engines affected by these instruments are biased at once. The engines thus are speeded up or slowed down proportionately.

The biasing regulators facilitate efficient adjustment to different power requirements when the station changes from pumping a batch of one product to that of another.

Control console. A feature of the control console is the use of Scam alarm indicators. These show the danger point by illuminating a small pane in the panel marked with the name of the trouble. There is an alarm panel (with six panes each) for each engine and another panel of nine panes indicating station conditions.

A dangerous situation is indicated by sounding of a horn and flashing of a light at the indicating pane. When an audio stop button is depressed, flashing stops at the pane and the horn turns off. The pane remains lighted until the trouble is corrected. This type of alarm is an innovation in pipelining.

Auxiliary engines and generators. Sufficient generating capacity is provided to take care of each station's requirement. There is also a spare unit as a standby precaution.

Station buildings are of concrete construction with brick walls. Because of the excellence in Argentina in the use of these materials, this type of building is appropriate and economical.

Each station has a relief tank.

Automatic pigging. To facilitate the use of batching pigs, the Fish organization has designed an automatic pig receiving and sending system. The sending portion of this system functions by a signal given with a delay equal to the time required for the product stream to pass through the pump-station piping. The delay interval is determined by the time taken by the product to pass through a section of the upstream pipeline, equivalent to the length of the stream piping through the station between the two scraper traps.

Precision timing of the automatic pigging system has been utilized to minimize interface contamination.

Pipe

All line pipe in the Tucuman to San Lorenzo section of the products line meets the API 5LX specifications. It has minimum yield strength of 42,000 psi. Wall thickness is 0.281-in. except at submerged river crossings where heavier pipe was used. Wall thickness was computed in accordance with the ASA Refinery and Oil Transportation Code, 1955 edition. Pipe is all welded; it has been hydrostatically tested to a maximum of 1,400 psi., and in no case below 1,200 psi.

Batching pigs will be run between product tenders. Occasionally, scrapers will be run to improve pipeline efficiency.

Strainers of self-cleaning jet type are installed at each station. Santolene "C" rust inhibitor will be injected in the products stream passing through the line.

Matters Relating to Both Lines

The natural-gas line was built by three spreads of COGAR, an affiliate of River Construction Corp. The products line was built by TECHINT.

Only two stations of the two lines are located in the same vicinity. These are compressor station No. 4 of the gas line and pump station No. 9 of the products line.

Both lines are suspended from the 1,100-ft. concrete bridge across Rio Bermejo. The bridge was originally designed with brackets set in the overhanging projection of the bridge. To these brackets, the frames for supporting the pipe were attached.

Each of these frames has a hinge feature and a roller to minimize horizontal stress which might be transmitted to the bridge. The gas line is suspended on one side of the bridge and the products line on the other.

The same type of coating was provided for both lines. This consisted of asphalt enamel, glass mat, and an outer wrapping of kraft paper.

Both lines will be served with microwave communication.

How to get hi-fi feedback from plant and yard

Henry will level with management if management levels with its people. Keep him informed—the good along with the bad, in simple language, and he'll feel encouraged to talk. When he does, be a good listener.

BY DANIEL J. PETRUZZI

WE MAY NEVER know all that's on the minds of the men down in the plant and out in the yard, but we'll know a lot more if:

- We first make sure we really want them to talk.
- We understand the roadblocks and problems.
- We create the atmosphere and learn the techniques which stimulate feedback.

True communication is a two-way street—an exchange. Otherwise you don't have communication. All you have is an informing process. Still, many people have thought about communication as informing the other fellow, and in recent years industry has done more on downward, or information, communication. We haven't conquered that one yet, either, but the current interest in this newer phase—an upward flow—is understandable.

We are becoming more concerned about how our people feel. This is quite a development. It isn't too many years ago that we were not only **not** interested—we were downright belligerent about it. The prevailing attitude, particularly in the yard, was: Do your job, don't ask any questions, and you won't get into any trouble.

In the postwar period we mellowed considerably. We began to realize that we had to keep our people informed, tell them about our business. This again was still somewhat of a Lord Bountiful approach. "We up here are going to tell you people down there what's going on." Now we seem to have come full circle: We also want to know what's on their minds. We want true communication to take place. We want "Henry" to talk.

We should. We seem to running into trouble because we don't really know. And we stand to get into a lot more trouble if we don't find out.

But to do so we have a lot to learn. Communication generally—and "feedback" particularly—is one of the most complex of human phenomena. It isn't ever easy to know what's in the minds and hearts of people. And when they tell us, we still can't be sure that we have a true signal. Nor can we be certain that, even if we have a true signal, what our people say will necessarily indicate what they'll do.

There are three main points to this problem:

1. We must be sure we **want** Henry to talk and why.
2. We must understand the roadblocks and the problems.
3. We must create the atmosphere and try to learn the techniques that stimulate feedback.

"It isn't ever easy to know what's in the minds and hearts of people. And when they tell us, we still can't be sure we have a true signal."

The author is manager of employe communication, public-relations department, Esso Standard Division, Humble Oil & Refining Co., Houston. This article is from a paper presented at the WPRA meeting at Corpus Christi, Tex.

First principle. We must sincerely want upward communication. We cannot just go through the motions. How often in our own daily lives have we asked for a friend's opinion? He gives it to us, and then it becomes apparent that we're not going to take his advice at all but go along our own merry way. His reaction is justified: "So why did you ask me?"

If we ask, we must face up to the fact that our people might **tell** us. Some of it won't be pleasant. And some of it may rock the boat a little—an industrial hazard that many managers shun like the plague. But when we ask our people for their ideas, opinions, and feelings, we must not only report back to them what they said, but we must do something about it. If we're not going to take any action, it's probably better not to ask them at all.

But getting good upward communication is in itself a rough highway—with all kinds of blocks and detours.

The biggest roadblock is the tendency people have to tell the boss what we think he wants to hear rather than the truth. Now, the boss depends on his subordinates for information in order to make good decisions. But the subordinate has an even tougher situation, because he depends on the boss for raises, promotions, perhaps his very job itself.

So, screening what you tell the boss is a very natural device of self-preservation. One could be accused of having rocks in his head, for example, if he told the boss something he knew full well would hurt him, the subordinate.

One aspect of this very human tendency is what I might term "party-lineism." Sooner or later everybody in an organization—and managers and supervisors are certainly the most adept at this game—gets to know the party line. This again stimulates a playback that closely coincides with what the boss wants to hear.

Let's say a company has embarked on an efficiency program. Cost reduction, effective utilization of manpower, strong supervision—all these become the party line of the day. When the boss checks to find out how the program is going, he'll usually get an everything-is-going-according-to-plan answer. Naturally! Think of what this does for the man reporting: You're smart. You know management objectives. You're a strong supervisor. You have excellent relations with your people and get good cooperation. Good man, that Jones!

Conversely, let's say you go back and tell the boss the facts: The efficiency program is highly unpopular with most employes. Morale is shot. Employes aren't cooperating. They think management is moving too fast. Management is going about it the wrong way. They're cutting out three clerks and hiring a $30,000 manager. In summary, employes think management is a bunch of lunkheads.

"Sometimes getting tuned in takes not only good listening but positive clairvoyance."

But if you tell your boss these facts, the specter that faces you might go something like this: You're a weak supervisor. You're not on the team. You don't run a tight ship. You can't get cooperation from your people. I must have made a mistake about Jones!

What would you say to your boss when you face these two alternatives?

But let's assume that everyone of us is selflessly and completely devoted to the greater good of the company. (We all know that this is rarely completely true.) But let's say we have ideal conditions for upward flow. Even so, you're going to get distortion. Information that is passed up through many levels is going to get twisted simply because human beings are not magnetic tape recorders.

The boss, in turn, must learn to listen properly—not just to what he wants to hear but to what people are saying. Most bosses want to feel that things are going smoothly. If they aren't, a boss may not admit it openly, but somewhere in the deep recesses of his mind he feels he has failed in some way. Despite personal involvement, the boss must learn not to screen out the unpleasant, but somehow to hear the whole story. Are we really tuned in?

Sometimes getting tuned in takes not only good listening but positive clairvoyance.

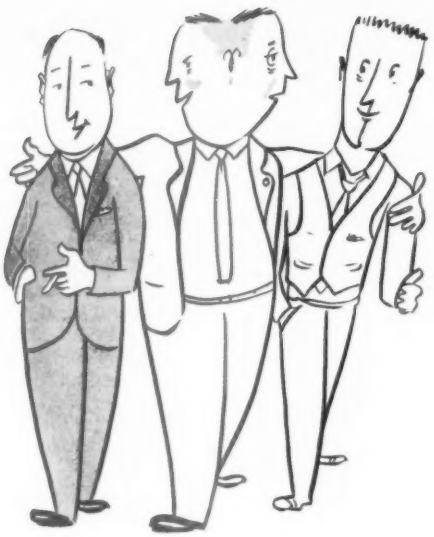
Recently, in one of our companies, a very important issue was before the people. Our management had done all the right things. They kept their ears to the ground, had people spotted throughout the plant to keep upward communication channels open. As decision day drew near, management made a final check. They were assured and reassured, "Don't worry, it's in the bag." Instead, the decision went against management wishes.

Hurt, management's "eyes and ears" went back. "How come?" Here's what the wage people said: "Look, you're a nice guy. We knew the decision was going to go against you, but we didn't want to upset you. Why should we be the ones to tell you the bad news?" Most human beings want to be nice. On the other hand, bosses too often hear what they want to hear.

Roadblocks. There are a few entrenched myths that get in the way of feedback. And the greatest of these myths is the open-door policy. "Anyone down to the lowest janitor," says the policy, "is free at any time to go to the top man." This is a real farce. Few employes in their right minds would dream of waltzing into their department manager's office, let alone the plant manager's. How many of you have ever dropped in on the president of your company for a chat? We should bury this myth once and for all.

The myth of "they." A refrain widely heard in business goes something like this: "**They** never tell me anything. They never asked me about it." Who is this phantom "they"? To people several levels below you, the "they" is you. All of us—managers, supervisors, and employes—have a responsibility in upward communication. We should ask questions, stimulate communication. That way we not only get — in the questions — an upward flow, but—in the answers—information for a downward flow.

Another mythical crutch is the suggestion box, or suggestion system. Many business people would like to believe that if you just set up a suggestion system, hang a beautiful little box in the corridor, your employes will tell you all. We have a suggestion



"... so supervisors have to be 'two-faced', so to speak—both management and employe oriented. This isn't an easy balance to achieve."

system in Esso. We use it mainly to get from our employes ideas which will save the company money. We pay for the ideas, and do get many good ones. But we certainly do not kid ourselves that we get much upward communication through that system.

Another myth is the "I-was-in-the-yard-myself-once" philosophy. This assumes that a management man who 20 years ago was in the ranks can now, 20 years later, divine what wage people are thinking. Or failing that, that he is so beloved, has such wonderful contacts among his old friends in the yard, that he can quickly find out. He is kidding himself.

So much for the problems. What can we do to get upward communication?

Creating the atmosphere. Undoubtedly, the ideal situation is to have universally good managers—who really know how to manage—and the complete trust and confidence of all your employes. When you have managers with a sound grasp of human relations and widespread trust and confidence among your people, the total communication problem is reduced to a minimum. But reaching this industrial utopia is a tall order. It would mean that stature of the company in the community and the nation is high. That company operations are smooth and profitable. That growth prospects are good. That managers are uniformly the best. That employes are getting good and fair treatment.

Blessed is such a company, for it will have little need for techniques and gimmicks. But probably very few companies have such a situation. Certainly, it is a worth-while goal for every company. Meanwhile we must search out and use whatever methods we can find or create to improve the upward flow of information and feelings.

The first place to start is with our managers and supervisors. There are many blocks and problems, as I have indicated, right there. We cannot assume that all of our supervisors are completely on our side, understand our problems and objectives, and have no difficulty in communicating among themselves.

Supervisors certainly are an avenue for upward communication. And you might think they would be a very effective channel. Here again, we have a lot to learn. First of all, to be effective supervisors, they have to be heavily management oriented. They have to interpret and carry out management objectives. On the other hand, they cannot be so management oriented that employes regard them purely as top management's minions. So supervisors have to be "two-faced," so to speak—both management and employe oriented. This isn't an easy balance to achieve.

Nor does the problem stop there. Supervisors don't always communicate well among themselves, as I've said. But, in addition, they don't always feel they have true management status, and they reflect this to their people. Nobody wants to talk to a figurehead—"a management dummy." If a supervisor doesn't have real authority, his people will be inclined to feel, "Why talk to him?" Beyond status, to be an effective channel, a supervisor has to be deeply informed on company policies, plans, practices, and progress. But perhaps more than anything else, supervisors need considerable training in understanding the communication process and in communication skills.

We also have to face the fact that employes just won't talk to some supervisors or any supervisor at all. There should be an alternate person employes can talk to. The personnel manager is a possibility, or someone who has the ear of the personnel manager. Then we have our women. Is there someone they can talk to, preferably another woman?

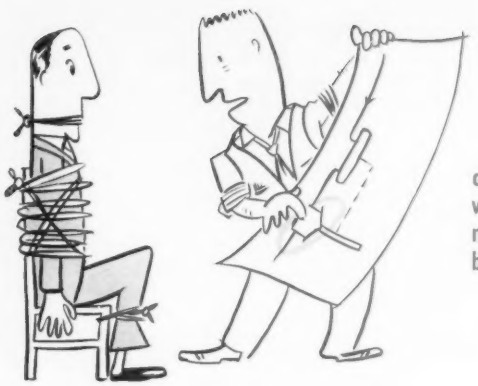
Training supervisors. For the last several years, Esso has made a major investment in the training of supervisors in such a way that they can see and feel the problems and blocks in communication. But these training sessions are more than communication. They are exercises and experiments to improve supervisory understanding of the management process and the forces of influence, power, and personal feelings in day-to-day situations.

These programs have their genesis in social-science research on group behavior. Their grandparents, you might say, are the human-relations training laboratories like Bethel, Maine, and Arden House.

We do the training in several ways. Some of you may have heard of Baton Rouge's Gulf Hills program or Bayway's at West Point, N. Y. We take a group of 10 to 15 supervisors off the job for anywhere from 3 days to 2 weeks. These sessions are conducted by the best social-scientist brains we can find, mainly from leading American universities. At these sessions our supervisors, both from the same level and different levels, learn not just by talking but by actually experiencing feelings in relation to each other and analyzing both their own personal behavior and that of others.

The results are very encouraging. We have found that the sessions do stimulate their understanding of the management process and of their own interpersonal relationships. After they've been there, our people seem to listen better and feel freer to express their opinions. There is a greater awareness of personal feelings and recognition of the experience and backgrounds of their colleagues.

This is best shown by some of the comments from our people. After the meeting a supervisor will say, "I'm now in a much better position to communicate with my boss." A division head says he can see a difference in his first-line supervisors' relations with himself. They're more friendly, seem to have more appreciation of his problems. Another supervisor says, "I knew wage earners didn't talk freely to the boss, but I thought they were telling me what they really thought. Now I



"Where does employe participation—indeed even supervisory participation—stop and management's right to manage begin?"

know different, and I know I have to work hard to make them open up."

Encourage participation. In addition to supervisory training, there are other techniques we can use and try. One thing may be so obvious we can easily overlook it. We have to tell our people clearly that we do want to know how they feel and what they think. All of us in this respect are very human. We want to be asked. We feel hurt if we aren't, but certainly we rarely speak up freely unless we are asked.

Participation and involvement is always a good stimulus to communication. Do employes have a say in planning programs? Are they encouraged as a natural and regular course to contribute ideas on ways of doing things? Are their ideas accepted and put into practice when they do?

In recent years there has been considerable talk about participation. Like motherhood and Americanism, everybody's for it. In fact, it is difficult to put into practice. For one thing, nobody seems to have any clear-cut idea of how far you can or should go. Where does employe participation — indeed even supervisory participation—stop and management's right to manage begin?

Fortune Magazine some years ago said that industrial participation programs "have been little more than well-meant fictions designed to give the worker a feeling of belonging and very little else." Perhaps we have to make small beginnings in true participation. And after we crawl, we can walk.

Several years ago in Esso, we made a beginning by letting our employes choose the colors for our refinery units in a plant-beautification project. Right now we're using joint management-employe committees on policies like safety clothing and vacation schedules.

I might mention here that we can get participation even on the part of union officers and wage earners, if we try. This can be done, for example, in joint community-relations projects with clear mutual interest for both management and employes.

At one of our refineries, for example, management and the union have cooperated in two community ventures—one called "Good Scout" and another called "Good Sport." The Scout program involved the clearing of several acres of woodland and the building of an artificial swimming and boating lake. The other, Good Sport, involved laying out and landscaping a football field. These projects not only produced a lot of good will both for the company and its employes, but, in addition, management and union officials, in the course of all the meetings and working together, established a very good communication atmosphere.

Attitude survey. Certainly another device that readily comes to mind is the attitude survey. And they are valuable. But they also have some drawbacks. Cost is usually one of them. More often than not outside consultants are used in framing the surveys, many times in administering them. But even if the cost were not a factor, we seem to have real difficulty in analyzing exactly what attitude surveys tell us.

Not too long ago, a company I know well conducted an extensive attitude survey in headquarters. Perhaps it was too extensive. In any event, it was meticulously framed with the help of a leading American university group of specialists. It probed many areas—supervision, wage and salary policies, benefits, communication, corporate image, product quality—just about the whole bundle. There were almost a hundred multiple-choice questions. Although it was voluntary, employes cooperated beautifully. More than 85% filled out the questionnaire.

Then the fun started. For months management people debated about what the survey told them. Universally accepted conclusions were extremely rare. Several bad things happened. For one thing, very little of the findings was ever reported back to employes. And this was not so much that the results were bad. In fact, they looked good, generally speaking. But nobody seemed to know what interpretation should be placed on those things which on the surface looked a little bad. For example, on a salary question, roughly one-third of the people said they were satisfied, one-third said they were dissatisfied, and one-third said they were neutral. Management never did agree on what the neutrals were trying to say.

There is at least one big advantage to outside consultant-type surveys. "Inside" people can **tell** management until they're blue in the face. But if management decides to spend $20,000-$25,000 to find out the same things, it will have more impact in moving the boss to do something.

We need to find new and more effective ways of making surveys. Esso currently is experimenting with what we call "quickie" surveys. These are a one-card survey on IBM cards which are easily sorted. Any given survey covers a limited area in 7 to 10 questions. They seem to be administered easily. Certainly they seem to be analyzed more effectively. Of course, they have the limitation of telling you only part of a story at any given time.

We are also experimenting with another device for upward communication. This involves small selective discussion panels. Recently, we set up two of these panels to discuss a unit-wide problem in our headquarters.

". . . in a unit like a refinery one good man could go a long way toward getting the pulse of our people."

One of the panels is made up of high middle management. A second panel is made up of first-line supervisors. They were all hand picked, and they represent every department in the building. Each panel has discussed the problem by itself.

Employe relations people stay completely in the background, and discussions do not have any of the personnel-type "flavor." Later, write-ups of the discussions in the two panels are exchanged. There has been considerable agreement between the two panels on many findings. At the moment, the management panels are, without aid from specialists, discussing what should be done about their findings. Later, specialists will be called in to help. So far, our results seem to be encouraging. Panels may be a device to bring out a lot of employe reaction.

Meetings. Employe meetings can be a good avenue of upward communication. But in this area they are only good if employes feel free to ask management any and all questions. And management, preferably the top man, must be willing to "field" every question, no matter how difficult or embarrassing. There is one problem in employe meetings. Many people will not stand up in an open meeting. To encourage questions, we have found one little device useful. At the beginning of the meeting we pass out 3 by 5 cards. Employes can write the questions on these cards, pass them into the aisle, and an usher delivers them anonymously to the meeting leader.

Some companies are doing very well with question-and-answer columns in their publications. Again, this device is effective only if questions aren't screened. If employes sense that management is answering only those questions which suit their purposes, you might just as well ditch the whole approach. Answering the questions takes a lot of time. An additional complication is that they should be answered by a top person. Few refinery managers, I suspect, are willing, or feel they are able to do so.

Contests can be valuable. Our company now has a Sell Esso program going. This program is designed to get employe support behind company products. In addition, we hope that it will serve to build morale behind an obviously mutually good goal. But, in addition to the many new customers we acquired, we did get a communication bonus. This is in the complaints both from employes and customers and ideas from our people on how to remedy situations.

Studying absentee and turnover statistics is of some value. They're generally pretty good indicators of morale level. The trouble with statistics is that they can't explain to you why people are absent nor why they are leaving the company.

Some of this is elicited by exit interviews. But there again there's a major pitfall. Many times the subjects of exit interviews are not leaving the company voluntarily, but are people who in one way or another were "nudged" a little. They don't go into exit interviews with exactly objective views. To get valuable results on this kind of interview takes considerable skill.

In the final analysis, it might be that in a unit like a refinery **one good man** could go a long way toward getting the "pulse" of our people. He would have to be trusted and accepted by both employes and management. He would have to be someone who has been around for a long time. He would have to be knowledgeable and skillful. His only job would be to circulate throughout the plant talking to people. He might indeed be able to get the true pulse.

Although the bulk of these remarks is on upward communication, I would like finally to emphasize one point: We cannot divorce upward communication from downward. If management levels with its people, keeps them truly informed—the bad along with the good—in simple language, employes and supervisors will feel encouraged to talk.

Ingenuity is at work on one of the projects now in progress at Humble Oil & Refining Co.'s Esso Division plant at Baton Rouge.

Esso workers are installing some insulated piping and tankage for intermediate storage of feed to the catalytic cracking units.

The picture shows the system used to set up some of the insulated piping. In the shop the 16-in. line was welded to about 90-ft. lengths and transported to the site of the lift.

At ground level, the 90-ft. sections were welded together, insulated, and waterproofed, then lifted by a series of cranes to the pipe band, 30 ft. above the ground. This procedure made only a small amount of work necessary in the pipe band, and no scaffolding was required. The lift shown here involved 297 ft. of pipe.

22. How to determine the k_g/k_o ratio from production and fluid-analysis data

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GIVEN: The following production and fluid-analysis data were obtained from a sand reservoir in Arkansas:

Run No.	(1) Pressure, p, (psig.)	(2) Inst. GOR, R_I, std. cu. ft. per stock-tank bbl.	(3) Oil FVF, β_o, res. bbl. per stock-tank bbl.	(4) Gas FVF, β_g res. bbl. per std. cu. ft.	(5) Sol. GOR, R_s, std. cu. ft. per stock-tank bbl.	(6) Cum. oil prod., N_p M.M. bbl.	(7) Viscosity ratio, μ_o/μ_g
1	3,548	770	1.450	0.000815	770	0	...
2	3,448	850	1.443	0.000840	752	0.476	30.4
3	3,303	920	1.432	0.000875	725	1.743	32.1
4	3,153	990	1.420	0.000910	695	2.818	34.0
5	2,938	1,000	1.403	0.000970	657	4.632	36.8
6	2,813	1,020	1.393	0.001010	632	6.030	38.4
7	2,678	1,180	1.382	0.001062	608	7.360	40.5
8	2,533	1,420	1.371	0.001122	580	8.751	42.4
9	2,453	1,510	1.364	0.001162	565	9.873	43.6
10	2,318	1,660	1.354	0.001230	540	11.259	45.5
11	2,153	1,920	1.340	0.001330	509	12.619	48.0
12	1,978	2,220	1.326	0.001453	476	13.998	50.8
13	1,818	2,480	1.313	0.001590	446	15.321	53.8
14	1,658	2,710	1.301	0.001758	416	16.552	57.4
15	1,625	2,800	1.298	0.001795	410	16.929	58.2

OTHER DATA: Original stock-tank oil in place, from geological and volumetric analysis, 116.5 million barrels; interstitial-water saturation, 28.5%; bubble-point pressure, 3,548 psig.

FIND: Relationship between permeability ratio (gas to oil) and total liquid saturation.

METHOD OF SOLUTION: The determination of the k_g/k_o ratio from production and fluid-analysis data involves the use of the instantaneous gas-oil-ratio equation.

$$R_I = R_s + \frac{\mu_o}{\mu_g}\,\frac{k_g}{k_o}\,\frac{\beta_o}{\beta_g} \qquad (1)$$

or

$$\frac{k_g}{k_o} = (R_I - R_s)\,\frac{1}{\mu_o/\mu_g}\,\frac{\beta_g}{\beta_o} \qquad (2)$$

Where:

R_I is instantaneous GOR, std. cu. ft. per stock-tank bbl.

R_s is solution GOR, std. cu. ft. per stock-tank bbl.

μ_o is viscosity of oil at reservoir conditions, cp.

μ_g is viscosity of gas at reservoir conditions, cp.

k_g/k_o is permeability ratio, gas to oil.

β_o is formation volume factor of oil, res. bbl. per stock-tank bbl.

β_g is formation volume factor of gas, res. bbl. per std. cu. ft.

The total liquid saturation corresponding to each respective k_g/k_o is given by the equation:

$$S_L = S_w + (1 - S_w) \times \frac{N - N_p}{N} \times \frac{\beta_o}{\beta_{oi}} \qquad (3)$$

Table 1—Calculations of Permeability Ratios

Run No.	(8) β_g/β_o (4) ÷ (3)	(9) $(\mu_g/\mu_o)\times(\beta_g/\beta_o)$ (8) ÷ (7)	(10) $R_I - R_s$ (2) − (5)	(11) k_g/k_o (10) × (9)	(12) $\frac{N - N_p}{116.5 - (6)}$ M.M. bbl.
1	0.000562	0	0	0	116.500
2	0.000582	0.0000191	98	0.00187	116.024
3	0.000611	0.0000190	195	0.00371	114.757
4	0.000641	0.0000189	295	0.00558	113.682
5	0.000691	0.0000188	343	0.00645	111.868
6	0.000725	0.0000189	388	0.00733	110.470
7	0.000768	0.0000190	572	0.01087	109.140
8	0.000818	0.0000193	840	0.01621	107.749
9	0.000852	0.0000195	945	0.01843	106.627
10	0.000908	0.0000200	1,120	0.02240	105.241
11	0.000993	0.0000207	1,411	0.02921	103.881
12	0.001096	0.0000216	1,744	0.03767	102.502
13	0.001211	0.0000225	2,034	0.04577	101.179
14	0.001351	0.0000235	2,294	0.05391	99.948
15	0.001383	0.0000238	2,390	0.05688	99.571

Where:

S_L is total liquid saturation, fraction of pore volume.

S_w is interstitial water saturation, fraction of pore volume.

N is initial oil in place, stock-tank bbl.

β_{oi} is initial oil formation volume factor.

SOLUTION: For a problem of this type it is best to set up the solution in tabular form. The table of basic data here as Columns 1 through 7 will be continued in the solution.

The data for a pressure of 1,625 psi. will be used with Equations 2 and 3 to illustrate the method of calculation.

$$k_g/k_o = (2{,}800 - 410) \times \frac{1}{58.2} \times \frac{0.001795}{1.298}$$

$$= 0.05688 \approx 0.057$$

$$S_L = 0.285 + (1 - 0.285) \times \frac{116.500 - 16.929}{116.500} \times \frac{1.298}{1.450}$$

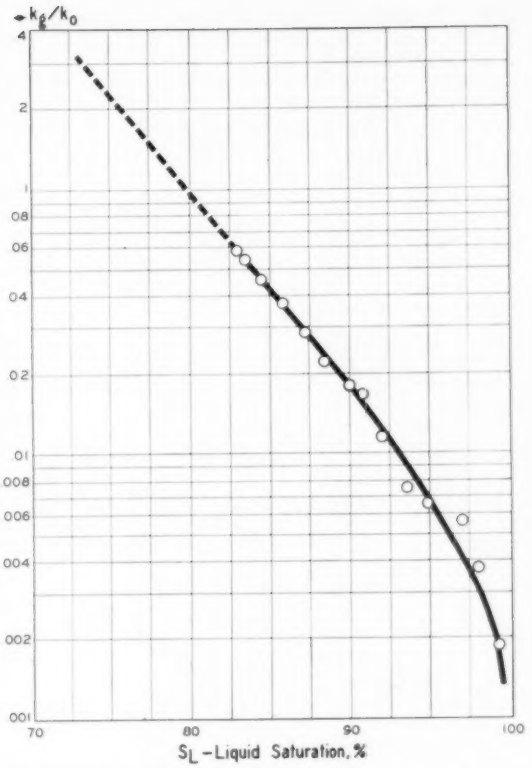
$$= 0.832 \text{ or } 83.2\% \text{ of pore volume}$$

DISCUSSION: Equation 1 is normally used to compute the instantaneous gas-oil ratio, R_I, when the necessary fluid and rock properties are known.

In this problem it is used to solve for the average gas-oil permeability ratio of a sand reservoir. The assumptions made in this application are: (1) the pressure drawdown in the vicinity of the wells is negligible, (2) the gas and oil are uniformly distributed throughout the porous media and are flowing according to the equilibrium relative permeability concept, (3) the pressure gradients are the same in the oil and gas phases, and (4) gravity and capillary pressure effects are negligible.[1,2]

Data for the solution of Equation 2 are obtained from laboratory tests on reservoir fluid samples and from well tests. Twenty-four production tests are usually used to evaluate R_I, the instantaneous gas-oil ratio.

For each permeability ratio computed it is necessary to determine a corresponding total liquid saturation. Equation 3 defines this parameter with the assumptions that (1) the reservoir pore volume remains constant during the production history (no water or gas influx) and (2) oil and gas remaining within the reservoir are distributed evenly throughout the pore space.[1] For conditions where the reservoir is not of constant volume, the equation must be modified for the amount of water or gas encroachment and the resulting expression becomes considerably more complex. Note that in Equation 3 the initial oil in place (N) and cumulative oil production (N_p) must be known.



PERMEABILITY RATIO for sand reservoir in Arkansas. Fig. 1.

It is difficult to conceive that any reservoir could satisfy the assumptions made in the equations used because: (1) in most cases pressure drawdown occurs at the well bore, (2) free gas distribution will be uniform, either vertically or horizontally, (3) gas will often come from a primary or secondary gas cap into the producing wells. These factors frequently tend to make the apparent R_I and k_g/k_o higher than they actually may be at the existing liquid saturation. The opposite effects may also be observed.

In spite of the many limitations imposed by field conditions, permeability ratios determined by this method are perhaps more representative of the reservoir than the average of data determined on a few small cores. Frequently the amount of field data is limited. In such a case laboratory data could be used (follow same slope or trend) to extrapolate the field data. Where no field data are available, an average laboratory determined relationship can be used and later checked with field data.

and corresponding total liquid saturations

Run No.	(13) $(N - N_p)/N$ (12) ÷ 116.5	(14) β_o/β_{oi} (3) ÷ 1.450	(15) $[(N - N_p)/N]$ (β_o/β_{oi}) (13) × (14)	(16) $(1-S_w)(N-N_p)$ $\times (\beta_o/\beta_{oi})$ $(1/N)$ 0.715 × (15)	(17) S_L 0.285 + (16)
1	1.000	1.000	1.000	0.715	1.000
2	0.996	0.995	0.991	0.709	0.994
3	0.985	0.988	0.973	0.696	0.981
4	0.976	0.979	0.956	0.684	0.969
5	0.960	0.968	0.929	0.664	0.949
6	0.948	0.961	0.911	0.651	0.936
7	0.937	0.953	0.893	0.638	0.923
8	0.925	0.946	0.875	0.626	0.911
9	0.915	0.941	0.861	0.616	0.901
10	0.903	0.934	0.843	0.603	0.888
11	0.892	0.924	0.824	0.589	0.874
12	0.880	0.914	0.804	0.575	0.860
13	0.868	0.906	0.786	0.562	0.847
14	0.858	0.897	0.770	0.551	0.836
15	0.855	0.895	0.765	0.547	0.832

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HOW TO REDUCE DRILLING COSTS. PART 3

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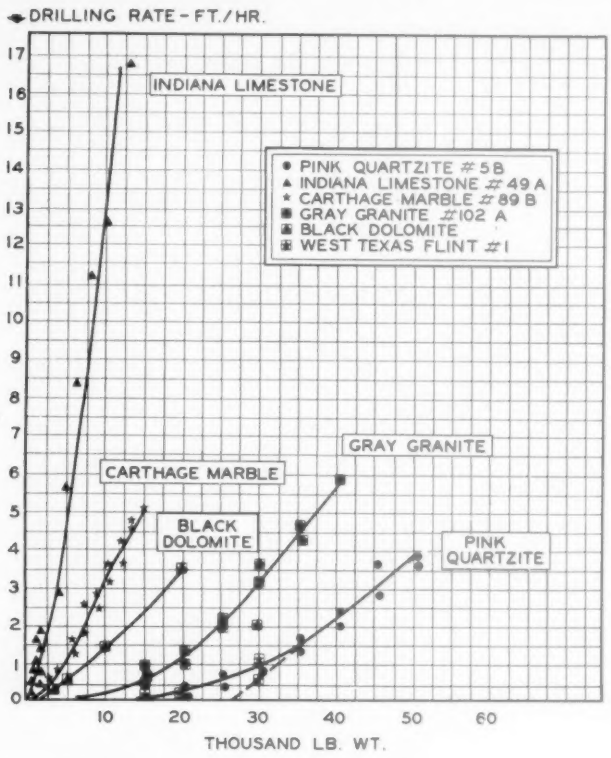
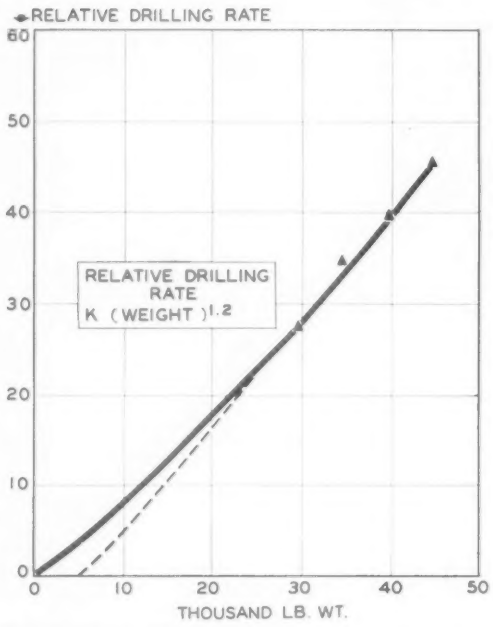


TYPICAL EFFECT of bit weight on penetration rate for various rocks—laboratory data, atmospheric pressure. (Courtesy Hughes Tool Co.[1]) Fig. 1.



EFFECT OF BIT WEIGHT on penetration rate as obtained from West Texas field data.[2] Fig. 2.

Six variable factors that affect penetration rate

1. Bit weight. 2. Rotary speed. 3. Drilling-fluid properties 4. Drilling-fluid hydraulics. 5. Rock properties. 6. Bit selection

WE STILL do not completely understand all of the many factors which affect rate of penetration. Undoubtedly, there are important variables which we do not yet recognize, and it is quite difficult to isolate completely any one particular variable. This makes a rigorous analysis of drilling rate complicated. For example, interpretation of field data may be uncertain as a result of the possibility that changes in rock properties have gone undetected. Studies on the effect of drilling fluid are always plagued by the difficulty of preparing two muds with all properties identical except the one under observation.

Most often faster drilling means cheaper wells. However, penetration rate should not be the only consideration. The fastest **on-bottom** drilling rate does not necessarily result in the lowest cost per foot of drilled hole; other factors such as accelerated bit wear, equipment failure, etc., may raise cost. This is shown by Equation 1 which includes major variables governing cost per foot of drilled hole.

$$C_F = \frac{C_R(t_{mt}+D/\mathbf{R}_p)+C_B+C_A+C_C+C_M}{D} \quad (1)$$

Where

C_F = average direct drilling and completion cost/ft.

C_R = rig operating cost, $/hr.

t_{mt} = maintenance and trip time, hr.

D = feet drilled.

C_B = bit costs.

C_A = auxiliary equipment costs.

C_M = mud costs.

C_C = completion costs, including casing, cementing, etc.

$\mathbf{R}_p$ = average **on-bottom** penetration rate, ft./hr.

Clearly, cost per foot does not depend on $\mathbf{R}_p$ only, and it is quite possible to have increases in $\mathbf{R}_p$ resulting

in overcompensating increases in t_{mf}, C_B, C_A, C_C, and/or C_M.

Some of the more recognizable variables affecting penetration rate are the following:

1. Bit weight.
2. Rotary speed.
3. Drilling-fluid properties.
4. Drilling-fluid hydraulics.
5. Rock properties ("drillability").
6. Bit selection.

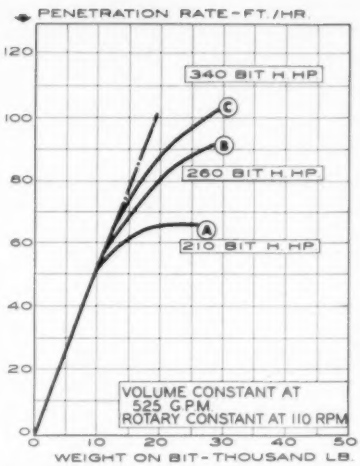
Future articles of this series will deal with the more fundamental aspects of the above topics; however, the present purpose is to summarize qualitatively their general effects as observed in laboratory and field experiments.

Weight on bit. Fig. 1 shows the general effect of bit weight on penetration rate as obtained in the laboratory[1] at atmospheric pressure. Fig. 2 is similar data from closely controlled field tests obtained by the AAODC in West Texas.[2] Fig. 3 was developed by Thompson[3] and shows that bit weight may reach an upper limit where drilling is completely governed by cutting removal. If bit loading goes above this point, there is little or no increase in drilling rate.

Because of these and other findings, we can make the following general conclusions:

1. Penetration rate in "soft" (easily drillable) formations is directly proportional to the applied bit weight, i.e., doubling weight doubles drilling rate. This holds true so long as the drilling fluid removes the cuttings or until the bit "founders."

2. In "hard" rocks penetration rate increases with bit weight at an increasing rate, finally becoming essentially linear above some "critical" bit load. Note, for example, the curve of pink quartzite in Fig. 1. Penetration rate increases very slowly until bit weight reaches 30,000 lb.; above this load the curve appears linear. Thus, over the entire bit-load range, drilling rate increases more than in direct proportion to bit weight. For this example, doubling W from 30,000 to 60,000 lb. multiplied penetration rate by 5.



COMBINED hydraulic and bit-weight effect on penetration rate in California drilling. (After Thompson,[3] courtesy API.) **Fig. 3.**

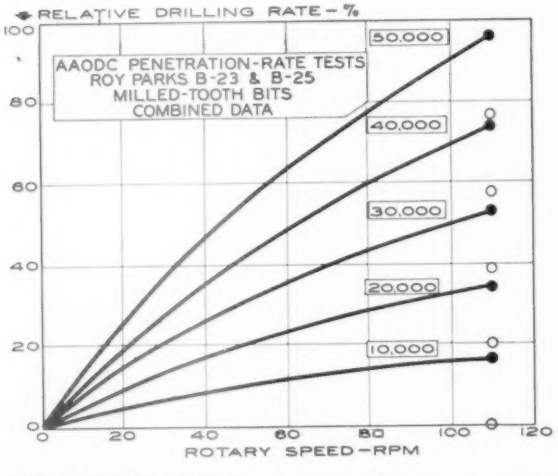
Rotary speed. The effect of rotary speed on penetration rate is not so well established as that of bit weight. Fig. 4 is typical field data[4]; typical laboratory data[5] are shown in Fig. 5. Not all available tests agree precisely with these figures, but the general trend is quite similar. Hence the general conclusion is that drilling speed increases at a decreasing rate as rotary speed increases.

Mud properties. It is difficult to prepare several mud samples, all identical except for a single variable being studied. This complicates the job of determining what exact effect that variable has on drilling rate. Still, it has been shown, at least qualitatively, how such standard mud properties as density, flow properties and filtration loss affect penetration rate.

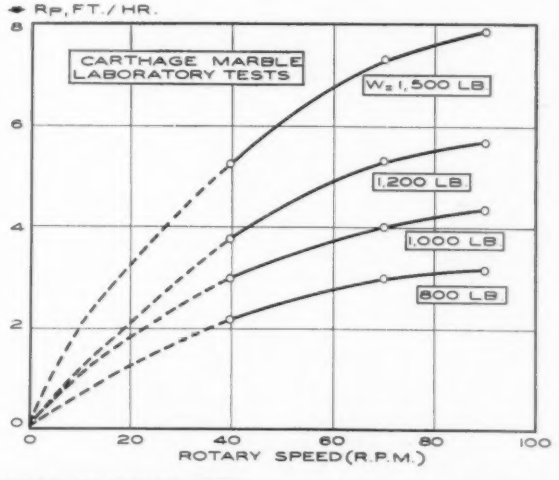
Fig. 6 shows how pressure differential between the mud column pressure (P_m) and the formation pressure (P_f) affects penetration rate. These are laboratory data by Cunningham and Eenink[6] under simulated subsurface conditions. Clearly, increasing ($P_m - P_f$) decreases drilling rate. P_m depends on mud density. So, it is evident that increased mud density decreases penetration rate. The magnitude of the decrease in a given instance is, however, dependent on other factors.

Fig. 7 shows the effect of mud filtration loss on drilling rate in Gulf Coast shales[7]. Note that high filtration rates improve drilling rate. In permeable rocks, the effect is often more pronounced. This illustrates the general mud-control paradox; low-water-loss muds are desirable for hole control and preventing formation damage but they generally slow penetration rate.

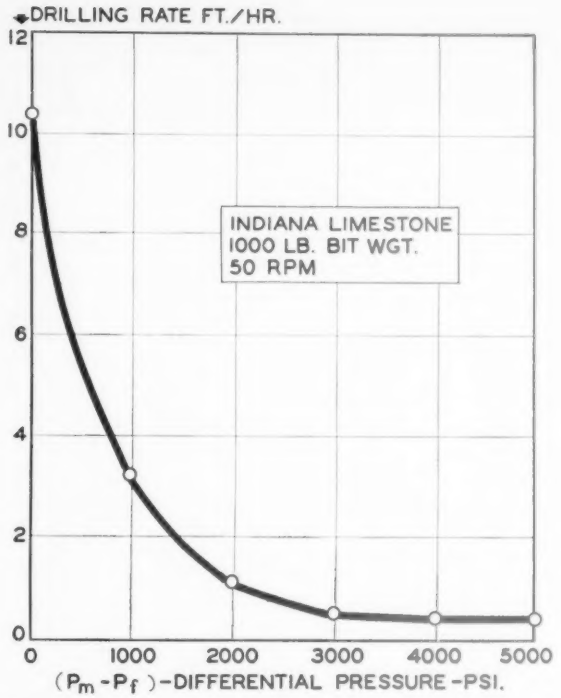
The flow properties viscosity, gels of muds also affect penetration rate. There are undoubtedly many factors contributing to these effects. It is difficult to isolate flow property effects from other factors such as solid content, density, etc. The data of Eckel[8] in Fig. 8 illustrate the general result, i.e., increases in viscosity (and yield



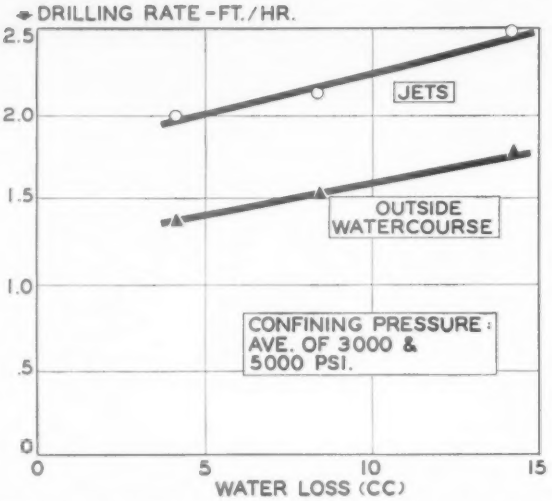
EFFECT OF ROTARY SPEED on penetration rate at various bit weights. West Texas field data obtained by AAODC.[4] **Fig. 4.**



EFFECT OF ROTARY SPEED on penetration rate at various bit weights. (After Wardroup and Cannon,[5] courtesy API.) **Fig. 5.**



EFFECT OF DIFFERENTIAL PRESSURE between borehole (p_m) and formation (p_f) on drilling rate of Indiana limestone. Laboratory data obtained under simulated overburden pressure of 6,000 psi. (After Cunningham and Eenink,[6] courtesy AIME.) Fig. 6.



EFFECT OF WATER LOSS on drilling rate in Gulf Coast shale—laboratory data, simulated confining pressure. (After Cunningham and Goins,[7] courtesy API.) Fig. 7.

"Low-water-loss muds are desirable for hole control and preventing formation damage, but they generally show penetration rate."

point) result in decreased penetration rate.

Rock drillability. In general, penetration rate varies inversely with the compressive strength of the rock being drilled. The related property of hardness or abrasiveness enters the picture because of its effect on bit life. The hardest and also the strongest sedimentary rocks are chert (a form of quartz, SiO_2) and various quartzites. (Refer back to Fig. 1.)

The stress under which a rock is confined has a great influence on its elastic properties. For instance, rocks which are very brittle at the surface may be quite ductile when drilled in a well[9]. Certainly such drastic changes in elastic behavior affects "drillability."

Bit selection. The above discussions make no mention of the effect of bit type on penetration rate. Certainly this is an important consideration. Selection of specific bit type is governed primarily by nature of the rock to be drilled. Bit manufacturers provide advice on which bit type is best suited for a particular formation.

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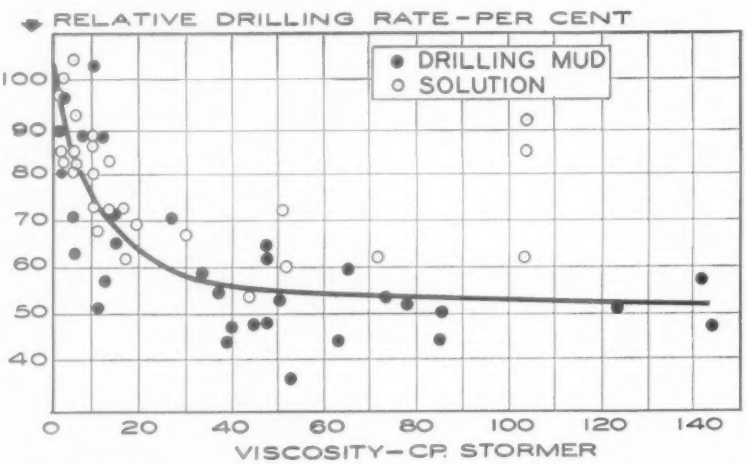
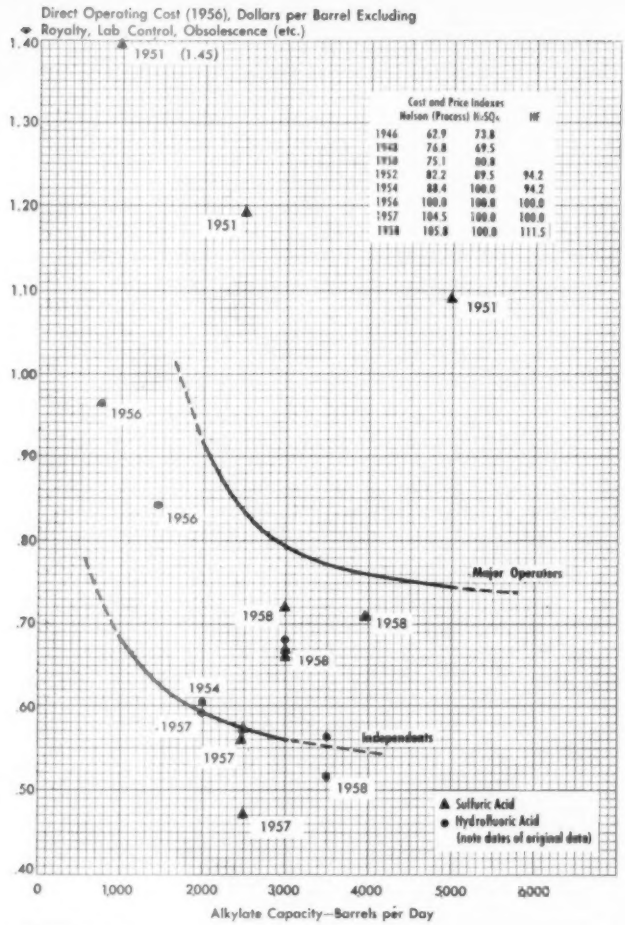


LABORATORY DATA showing effect of mud viscosity on drilling rate. (After Eckel,[8] courtesy API.) Fig. 8.

BY W. L. NELSON Technical Editor and Petroleum Consultant

Operating costs—alkylation



APPROXIMATE direct cost of operating alkylation plants. Fig. 1.

THE COST of catalyst acid is a major item in the cost of alkylation. Less and less acid has been needed (especially during the last 2 years), but approximate requirements are about as follows:

	HF Lb./Bbl.	H_2SO_4 Lb./Bbl.
Mixed olefins	0.2-0.5 (0.25)	0.3-2.0 (0.7)
Propylene	0.2-0.5 (0.25)	0.8-3.3 (1.3)
Amylene	0.2-0.5 (0.25)	1.0-1.9 (1.1)

Another reason for great variations in operating costs is the ratio of isobutane to olefin maintained. This ratio is held at least at 6:1 but recently larger ratios have been employed especially in HF alkylation.

Table 1 indicates the basic operating costs in alkylation plants and Fig. 1 shows the effect of capacity. These costs may be brought to date by means of the Nelson Operating (units) Cost Index and the price indexes of sulfuric and hydrofluoric acid. The direct operating costs are converted to (or from) various years by means of the Nelson (Process Unit) Operating Cost Index and the cost of catalyst by means of the suitable price indexes. Operating costs were very high during World War II and until about 1954. Costs based on the years 1943-1948 were so high that they cannot be plotted on Fig. 1 (values as high as $1.80 per barrel). This means that the practice of alkylation has been radically changed since 1946 (or 1953) by technological improvements.

TABLE 1—ELEMENTS OF OPERATING COSTS FOR ALKYLATION PLANTS (1956)

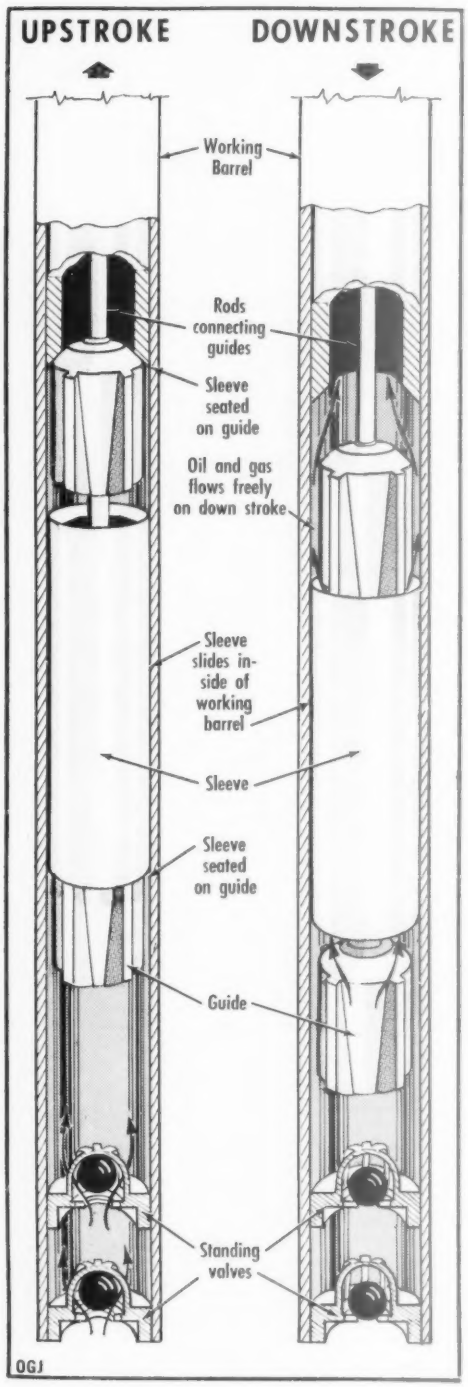
	Unit (somewhat standard)	1956 unit cost	For 2,000 B/D plant cts./bbl. product Independ.	Major	See Proc. Costimating
Labor-supervision	0.3 man/8-hr shift*	$3.85/hr.†	0.92	2.08	
Labor-operating	4 men/8-hr. shift*	$3.12/hr.†	9.75	22.40	26, 28, 41, 42
Maintenance	4.5-6.5%/yr. of replacement	$830-1,650/daily bbl.	10.20	29.40	29
Fuel or steam§	450-1,060 M B.t.u/bbl.	20-52 ct./M.M. B.t.u.**§	14.5-37.6	14.5-37.6	3, 4, 6, 30, 17, 18, 31, 33, 34, 37
Power	1.5-5.5 kwh/bbl.	0.86 ct./kw.-hr.	1.3- 4.7	1.3- 4.7	13, 14, 21-23, 26
Cooling water	2-4.8 M. gal./bbl. (24° rise)	1.7 ct./M. gal.	3.4- 8.1	3.4- 8.1	15, 38
Makeup water	3.5% of circulation	5-18 ct./M. gal.	0.3- 3.0	0.3- 3.0	16
Total direct cost, excluding acid (probable extremes)			47-67	80-100	
Sulfuric acid—					
Mixed feed	0.3-2.0 lb./gal.	$12/ton¶	17.6	17.6	
or Propane feed	0.8-3.0 lb./gal.	$12/ton¶	(32. 6)	(32. 6)	
or Hydrofluoric acid	0.2-0.5 lb./gal.	25 ct./lb. delivered	(6.30)	(6.30)	
Total direct cost for mixed feed—		sulfuric	64.84	97-117	
		hydrofluoric	53-73	86-106	
Laboratory control	0.6-1.5 men/8-hr. shift	$3.12/hr.†	2.25	5.64	26, 28, 41, 42
Royalty—H_2SO_4		15 ct./bbl.‡	15.00	15.00	
or HF		20 ct./bbl.‡	(20.00)	(20.00)	7
Obsolence, insurance, taxes and interest (7½%/yr. of replacement)			17.1	29.4	
Other charges			34-39	50-55	

*Independent operators use about two-thirds as many men as shown, and major operators about 50% more.
†Average U. S. wages plus 27% for all burdens.
‡Is applied toward a paid-up royalty of $1 per bbl. (HF) or $1.50 ($H_2SO_4$).
§Some references supply all heat as steam whereas others use no steam. Highest cost for heat supplied as steam.
¶Actual delivered price $20 per ton but spent acid assigned a value of $6-$10 per ton.

Here's a revolutionary downhole pump

Operating on a new principle, this pump represents the first radical design change in 54 years. Elimination of conventional ball-and-seat valves gets rid of tendencies to gas lock.

BY W. B. BLEAKLEY
Production Editor



A BRAND-NEW idea has been introduced into the pumping picture: a rod-actuated plunger pump that doesn't use a ball-and-seat traveling valve.

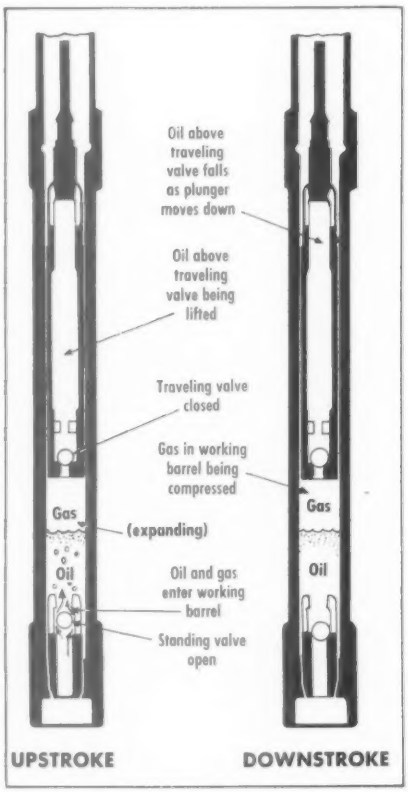
Plunger pumps have been improved continuously since the time of the Drake well, but this is the first departure from the ball-and-seat principle.

How it works. The Reynolds pump, distributed by Reynolds Oil Field Sales Co., Oklahoma City, uses a valve-and-seat seal between a cylindrical plunger and a splined guide. Fig. 1. The assembled pump can be made up of as many as five splined guides, joined together in a single unit by the connecting rods. The chrome-plated sleeve, placed over the connecting rod before assembly, is sized to operate in standard API working barrels. The sleeve is shorter than the connecting rod between splined guides by an amount designed to permit free flow of oil and gas during part of the pumping cycle.

On the upstroke, the frictional drag between the sleeve and the working barrel causes the sleeve to move downward with respect to the splined guide. Contact between the sleeve and the guide is made, and a fluid-tight seal is effected between the

ON UPSTROKE, frictional drag between the sleeve and working barrel causes the sleeve to seat on the splined guide, making a fluid-tight seal. On the downstroke, the same frictional drag moves the sleeve off of the seat on the guide, and a free passage is available for movement of oil and gas. Fig. 1.

ON UPSTROKE of a conventional pump, gas accumulates in the working barrel if it cannot be vented. On the downstroke, the ball moves off of its seat only if pressure below ball is greater than pressure of oil on top of ball. If working barrel is full of gas, plunger only compresses and expands gas. Final pressure is not enough to unseat valve. Fig. 2.



"Operators report less trouble with wells that make sand since installing the pump"

beveled surfaces on the sleeve and the valve seat on the splined guide. The oil trapped inside the sleeve is then lifted a distance equal to the pump stroke.

On the downstroke, the same frictional drag causes the sleeve to move upward with respect to the splined guide, and the oil and gas is now free to move up through the assembly because there is no valve and seat on the underside of the splined guide. The special design of the guide provides a large passage through which oil and gas can move with a minimum of restriction.

A conventional ball-and-seat standing valve is located at the bottom of the working barrel, and operates in the usual manner. It admits oil into the barrel on the upstroke and holds it in place on the downstroke. As a special feature, the pump has two standing valves in series.

The unit is available in 1, 1¼, 1½, and 2-in. diameters.

Can't gas-lock. If gas accumulates in the working barrel of a pump equipped with conventional ball-and-seat valves, there is a possibility that the pump will gas-lock. To expel the gas, the pressure in the gas zone on the downstroke must be high enough to overcome the pressure of the fluid operating on the top of the valve. Only then will the valve open.

If the stroke is too short, or if too much gas has accumulated, the operation of the pump does nothing more than compress and expand the gas in the working barrel, and no oil is lifted. Lengthening the stroke or increasing the pumping speed can be helpful, and gas anchors are available that will relieve this problem in some cases.

In the Reynolds pump, the weight of the oil in the tubing is not acting on the valve, and is therefore not effective in keeping the valve closed, regardless of the amount of gas in the working barrel.

The force that opens the valve is the frictional drag between the sleeve and the working barrel.

Ideal for slim-hole multiple completions. Because of the can't-gas-lock feature, the Reynolds pump has enjoyed outstanding success in operating under packers. In a single completion, gas can be vented up the annulus, if there is no packer in the hole. But in a multiple completion, packers are required to separate the production from the zones, and the pump on the lower zone must operate without the benefit of gas venting. This new pump is ideally suited to this application, and will permit the successful dual completion of some problem wells that have gas-lock trouble in the lower zone.

Works in sandy wells. Several operators, when asked about their experiences with the pump, mentioned, besides the antigas-lock feature, that they had less trouble with wells that make sand since installing the pump. They feel that the extra clearance between the valve-and-seat surfaces on the downstroke eliminates much of the sand cutting experienced in conventional ball-and-seat valves.

Operators have reported no trouble in getting rid of sand produced after a fracture job. With bad sand-out conditions, a pump-pulling job is usually necessary after most of the sand has been produced if a conventional pump is used.

Shutting in a well that is making sand is the easiest way to insure a pulling job. But operators have reported numerous cases where some of their most troublesome wells have been shut in and returned to production without a hitch, with this new pump in the hole. Reason for this is the design of the pump which eliminates the ball-and-seat principle. More clearance is available between the valve and seat, and sand that settles out does not pile up on top of the valve.

QUALITY TRENDS IN EQUILIBRIUM FLUID CRACKING CATALYSTS—PART III

Based on Davison analysis of samples from about 50% of fluid units in the United States and Canada

PERIOD	PRESENT QTR. Aug.-Oct. 1959		PREVIOUS QTR. May-July 1959		YEAR AGO Aug.-Oct. 1958	
	Mean	Range*	Mean	Range*	Mean	Range*
Activity: D+L	29.6	23.9-35.3	28.8	23.7-33.9	30.5	24.7-36.3
Surface area: M^2 gm.	118	71-166	119	71-166	124	70-177
Metal contamination:						
Vanadium, V: p.p.m.	201	43-935	203	46-887	260	55-1228
Nickel, Ni: p.p.m.	84	17-407	78	11-547	83	16-438
Copper, Cu: p.p.m.	4	0.4-40	4	0.4-40	3	0.3-35
Sodium, Na: p.p.m.	564	96-3227	579	91-3701	482	89-2612
Iron, Fe: wt. %	0.37	0.11-1.28	0.36	0.11-1.22	0.34	0.10-0.14

*95% of fluid units tested fall within these limits.

Cat cracking catalyst values are essentially unchanged

IN THE accompanying table, Davison Chemical Co. continues its quality survey of equilibrium fluid cracking catalyst for the United States and Canada. The survey represents 66 of the 79 fluid units participating in the equilibrium catalyst testing program. This is about 50% of all units currently operating in the U. S. and Canada.

A comparison of the present quarter's values with the previous quarter indicates that all analyses have remained essentially unchanged from their previous levels. Therefore, there have been no significant changes in the average operation of the fluid units participating in this program.

In regard to the same quarter a year ago, there has been a decrease in the level of vanadium, but an increase in sodium contamination. All other tests are similar to the present quarter.

The
FOREMAN'S PAGE

How to

Measure rate of fluid flow

IN SIPHONING, it has been pointed out that a fluid will move from one location to another unless the flow is restrained or until the fluid reaches its own level. The siphon, however, at first glance appears to be an exception to the rule. A closer study of just how the siphon works shows that it really is no exception. Fig. 5 indicates the operation of a siphon.

The siphon is a bent tube with branches of unequal length open at both ends and is used to move a liquid from a higher point to a lower point, over an intermediate point higher than either. This action illustrates the effect of atmospheric pressure. Suppose the tube is filled with water and placed in the vessels as shown in Fig. 5. The water will flow from vessel A to vessel B as long as the level in vessel B is below that in vessel A and the level in vessel A is above the lower end of the connecting tube.

The pressure against the water in vessels A and B is atmospheric pressure or 14.7 psia. When the tube is full of water, the water in the branch CA would tend to be held up by the atmospheric pressure. The pressure of 1 ft. of water is 0.433 psi. This is the downward pressure. The upward pressure is 14.7 psi. The net upward pressure at vessel A is 14.7 minus 0.433 = 14.267 or 14.3 psi.

The water in branch CB exerts a downward pressure on the water in vessel B of 3 times 0.433 or 1.299 psi. The upward pressure of the atmosphere is 14.7 psi. The net upward pressure at vessel B is 14.7 minus 1.299 = 13.401 or 13.4 psi. Since the upward force at vessel A is greater than that at B, the flow will be from A to B.

Measuring Flow Rates

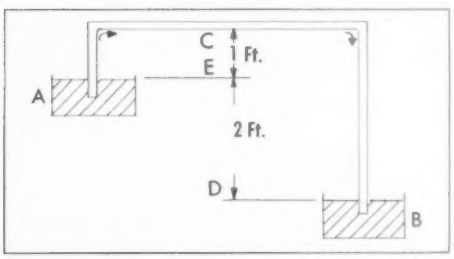
Pressure energy can be converted into velocity energy. When pressure is converted to velocity, pressure is reduced. This difference in pressure between two points in the line of flow is the principle on which the common flowmeter operates. There are a number of different types of equipment which depend on this principle for measuring flow. Remember that the term fluids applies to both gases and liquids, and that basically the same type of equipment can be used to measure the flow of either fluid. Some examples of flow equipment are:

Orifice plate. (See Fig. 6)—The pressure gages show that the upstream pressure P_1 is higher than the pressure, P_2 downstream from the orifice plate. The difference between pressure P_1 and P_2 (ΔP) is a measure of the flow through the orifice plate. Increase the flow through the line, and the velocity through the orifice plate will be higher.

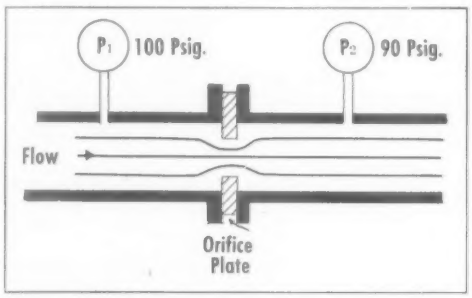
The difference between P_1 and P_2 would be greater. It is this difference in pressure that is the basis for calculating the rate of flow.

Venturi tube. (See Fig. 7)—Another method of measuring flow using the same principle of pressure drop is a Venturi tube. The pressure drop across the reduced section (P_1 minus P_2) can be correlated with flow rate. A Venturi tube is generally used to measure the flow of heavier fluids which might plug up an orifice plate.

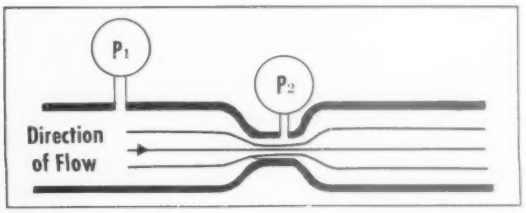
Pitot tube. (See Fig. 8)—The previous flow-measuring instruments were based on the principle of pressure drop. A Pitot tube converts velocity directly into pressure to measure flow. The pressure P_2 minus P_1 marily to measure flows in large lines, 20-in. in diameter and larger.



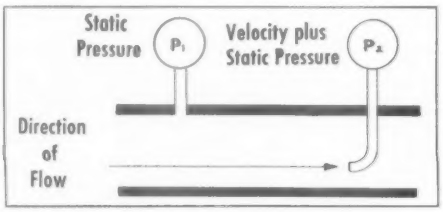
OPERATION of a siphon. Fig. 5.



PRESSURE DIFFERENCE shows rate of flow through orifice plate. Fig. 6.



VENTURI TUBE principle uses pressure drop across reduced section to determine flow rate. Fig. 7.



PITOT TUBE converts velocity directly into pressure. Fig. 8.

Take those marginal leases out of the margin

Most drilling is done by contract—why not lease management? Let the VP's spend their expensive time making policy-level decisions!

BY S. RUSSEL "PAT" CASEY, JR.,
President, Pat Casey & Associates

ARE YOU READY to abandon some of your marginal leases? Do you have weak producers that you are thinking of farming out? Are your operations too costly and too time consuming? It's time to call in a lease management contractor!

He may be able to produce your marginal wells for you. In addition, he can take over the responsibilities and perhaps cut lifting costs, too.

This is a day of specialists and consultants. When we have a tough problem sooner or later we must consult someone who specializes in that particular problem. The contract lease manager has been overlooked until recently.

Here's the problem. We're in the transition zone in the oil business. Changes are taking place at breakneck speed. Prominent oil-industry leaders advised us at the last annual meeting of the American Petroleum Institute, to "Cut expenses!", "Get into politics!" and "Diversify!"—to hedge against the uncertainties that lie ahead.

There's no denying that the oil industry is facing knotty problems for which no immediate solutions are in sight. For example, we can import oil cheaper than we can produce it into our stock tanks. As a result, it is unlikely that domestic production levels in our main producing states will be greatly advanced in the foreseeable future. In addition, certain congressmen seem hell bent on crippling the oil industry so they can subsidize it as they have the railroads, coal mines, farms, etc. These misguided politicians and bureaucrats persist in attacking the depletion allowance year after year; and to kill it, they need win only one time. To defend it, we must win year after year! Any downgrading of the depletion allowance will severly worsen an already serious situation. It would be tragic in certain areas.

This means that it's time to look at our hole cards—or in oil-field parliance, it's time to take hold of the tongs. We've got to step up our efficiency, pare expenses to an irreducible minimum. We've got to make the oil business pay our investors returns equal to or better than municipal bonds, or we will fail in our attraction to new capital.

How are your operations going? Have you taken an objective look at your operations lately? Is it possible that you are passing up a means of saving expenses and increasing profits? Are you making money out of operations? Would unitization of surface and/or subsurface operations in an entire field reduce costs and increase recovery? Could you go contract management and release your organization

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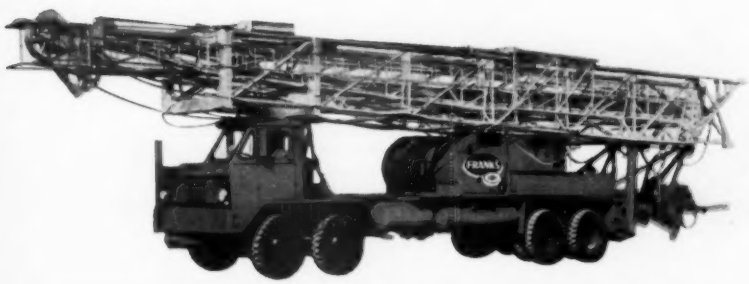
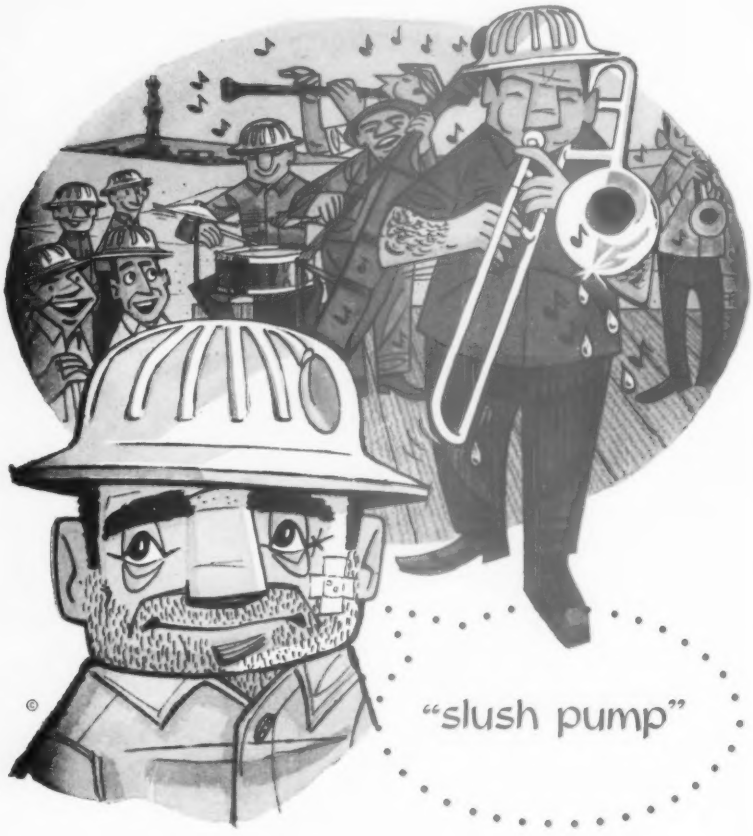


Congrats and $25 to R. STROHMEYER, J. M. Huber Corp., Borger, Texas



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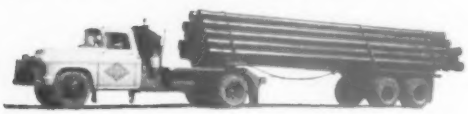

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of operational headaches and gain freedom to concentrate your ability and that of your staff toward future growth?

Decisions, decisions, decisions! Take a look at everything that's ordinarily involved in lease operation. Someone must supervise office operations, field personnel and operations, supply control, accounting, and billing. Can the man saddled with these responsibilities be effective in over-all planning? In most instances, the decision maker needs to be freed of details in order to keep up with the new scientific and technical approaches pouring from our laboratories and industry suppliers. He should have time to ponder industry trends, innovations, etc. in light of his own company's position.

In other words, the requirements of most organizations call for two different types of decision makers—one for over-all planning, the other for operational details. The man who must make both types of decisions may be costing his organization money, for too many decisions can lower the batting average so to speak.

Let's free our decision makers of details.

Look at the independent operator. He is the owner or part owner of a number of very expensive oil wells which more often than not are located many miles distant from his home and office. Because he so fully appreciates the great investment which the wells represent, he may often fail to take proper steps to protect his investment. Put differently, after spending some $320,000 for four or five wells and predicting the probable return on investment in light of proration schedules, he searches for a "cheap" contract pumper to save on lifting costs to advance payout.

How does this work out? Well, just dandy—sometimes. There are seemingly wells that are indestructible; nothing hurts them, they produce on and on year after year. But such wells are rare and all too often wells are sensitive things even to the extent of having personality. In addition to being expensive, they are easily affected and it appears that the more expensive they are the more sensitive they are likely to become.

Poor operations ruins wells. Take, for example, the case of a small independent company operating in Central Texas. There was a time when wells in this area were simply drilled into the various limestone formations, acidized, and produced, but today the wells must be fractured to be commercial, and in areas such as these the

sand-propping agent injected into the formation is the most important feature of the fracture operation. Unless the formation is held open the well simply will not produce. If the well surges one time production will fall.

Why? When the well surges it produces the sand from the "lip" of the fractures, thereby allowing them to close in the vicinity of the borehole. If this happens production dwindles and it makes no difference how many tons of sand have been pumped into the formation beyond the lip.

In an operation similar to the above, a company turned over its five-well lease to first one "contract pumper" and then another. In both instances the pumpers were engaged on the basis of "how much will you charge," not "how much do you know," and were not properly supervised. Between the two of them, the pumpers virtually ruined productive capacity of the wells. When the wells loaded with water, "rocking" was resorted to and production from the annulus without a choke amounted to surging, and there is little doubt but that the sand was produced from the lip of the fractures.

Proof of this is substantiated by the fact that offset production properly managed continued to flow its allowable. In the above case nothing short of additional fracture operations can restore these particular wells, and it is possible that they will not likely be restored to full capacity.

Take a second case of an operation in a gas area where a company was producing gas at a ratio in excess of pipeline limitations on water contained in the gas being delivered. Contact with a major supplier of gas dehydrating equipment resulted in an estimate in excess of $4,000 for a unit to dry the gas to meet pipeline specifications. Investigation of the management firm resulted in the use of existing equipment to remedy the water-saturation problem. Result? Gas was delivered to well within the requirements of pipeline specifications at a cost of less than $300 to the operators.

There are many similar examples to be found in almost every field. Generally the damage is due to unsupervised personnel, the results of which can go beyond mechanical damage to the well. If you have been in the oil business long, chances are you can recite many similar examples where independents and companies are suffering through mismanagement, disinterest, disloyalty, and in a few cases, ignorance of field personnel.

What about the majors and large independents? Before we discuss a possible solution to this and other problems, let's take a look at opera-

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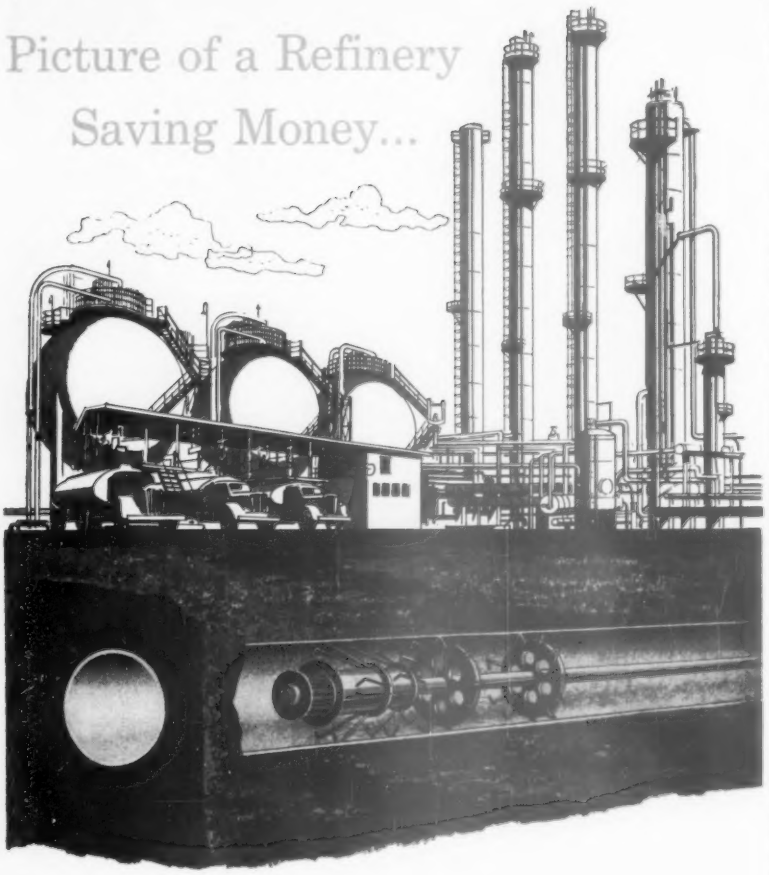

Spunline Relines Pipe Lines in-place without removing the pipe

Another refinery, it could be in Texas, California or Montana, will soon be enjoying the savings of another rehabilitated pipe line. The flow will increase, the pumping cost will drop and the pipe line will be good as new for at least another quarter of a century.

And traffic will move without interruption or inconvenience to the public.

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tions of another type—those of a major oil company or large independent. Full-time employment usually brings strong company loyalty and few of the large companies suffer from lack of loyalty among field personnel. In most cases major company employes are hand-picked and their quotient of professional skill is generally high and field performance is quite good. The trouble here comes from another source. Through the years the organization has experienced considerable growth and the natural phenomenon of increased overhead in most cases has become unbelievably high. What with the expenses involved in salaries of district and division offices chargeable to lease operations, most companies find that they cannot economically operate wells producing less than 6 bbl. per day. As a rule, the major company will either farm out or abandon and salvage leases where production falls below this level.

What's the solution? Contract lease management, supervised by competent engineers, can possibly solve the problem in many cases. Most drilling is done by contract—why not lease management? Several large companies have initiated the management practice with apparently good results.

With domestic allowables being curtailed and difficulty being encountered in finding new reserves, the oil industry has experienced a period of transition unique in its history. As a result, all individuals and companies are in the process of revamping their organizational setups. It is imperative that the executive potential of the oil man or firm be released to follow new channels and for the securing of new exploration leases or producing properties. Not infrequently the executive is burdened with field operations which prevent him from coping with existing difficulties. A contract operator stands ready to give relief to the executive of his burdensome problem of field operation, thereby giving him free access in a status for which he is best qualified.

Conclusion. It goes without saying that a great deal of money and time can be conserved, therefore holding the domestic line by cutting costs. A management firm can furnish a complete staff at a much reduced fixed cost. Part of the business of this staff is to acquaint itself with new methods and techniques of exploration drilling, well completion and operation. Considerable savings can be had in office space, accounting, payroll taxes, workmen's compensation, etc., through the elimination of unnecessary personnel.

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WPRA refining quiz on:

ALKYLATION, CONTROL, INSTRUMENTATION, AND POLYMERIZATION

THE PANEL

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WPRA Technical Director
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Derby Refining Co.
Wichita, Kansas

R. A. Ratliff
Continental Oil Co.
Westlake, La.

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American Oil Co.
Texas City, Tex.

G. M. Rose
Tidewater Oil Co.
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Universal Oil Products Co.
Houston, Tex.

W. L. Vermilion
The Standard Oil Co.
Cleveland, Ohio

P. S. Verity
Foster Wheeler Corp.
New York, N. Y.

Here are portions of a discussion at a regional meeting of Western Petroleum Refiners Association in El Dorado, Ark., at which refining experts answered questions on all phases of refining.

BANKS: Any information on road octane vs. research octane?

KERSEY: I have some information from recent report by DuPont's petroleum-chemicals division entitled "Octane Blending Characteristics of Alkylate." The report deals with performance of alkylate in gasoline blends. The alkylate was tested in three base stocks: full-boiling-range cat cracked gasoline of about 99.3. RON leaded; C_5 plus cat reformate at about 100 octane leaded; and a 50-50 mixture of the cat cracked and cat reformate. It was found that the octane number has a straight-line relationship with composition for blends with reformate by both research and motor octane number.

For blends with the catalytic cracked component, octane number has a straight-line relationship with composition by research method but not by motor method. Both research and motor octane numbers affect road ratings, and the road effect can be calculated from laboratory octane data. For road octane ratings with 3 mm. lead, alkylate in the cat cracked component fell slightly below a linear relationship as might be expected from the motor-octane blending characteristic of the mixture. However, the road-octane blend of alkylate in reformate tended to be higher than the linear relationship. This was not considered significant.

Considerable work was also done on blending different types of alkylates made by different processes, with different types of feed stocks.

BANKS: How much progress has been made in the HF process? In H_2SO_4 process?

KERSEY: We just recently put a HF alkylation unit on stream at Derby. It is a C_3, C_4 unit and has incorporated in its design most of the recent innovations for HF units. These are not necessarily innovations developed over the last year, but over the past several years. I'll just touch on them lightly. The advent of the fired-reboiler heater has done a lot in helping defluorination of alkylate. The development of the isostripper has reduced the investment and operating costs. The elimination of bauxite treaters has also reduced investment; the use of solid KOH for treating propane has removed traces of HF as well as kept the propane dry.

Pulling a side stream off the isostripper has eliminated a debutanizer tower for the alkylate and has aided in controlling alkylate Reid vapor pressure. A method of handling tars now allows them to be burned in process heaters adequately and satisfactorily. Use of Kel-F sheeting in gage glasses in HF service allows the level to actually be seen. Partial condensation of the isostripper overhead to en-

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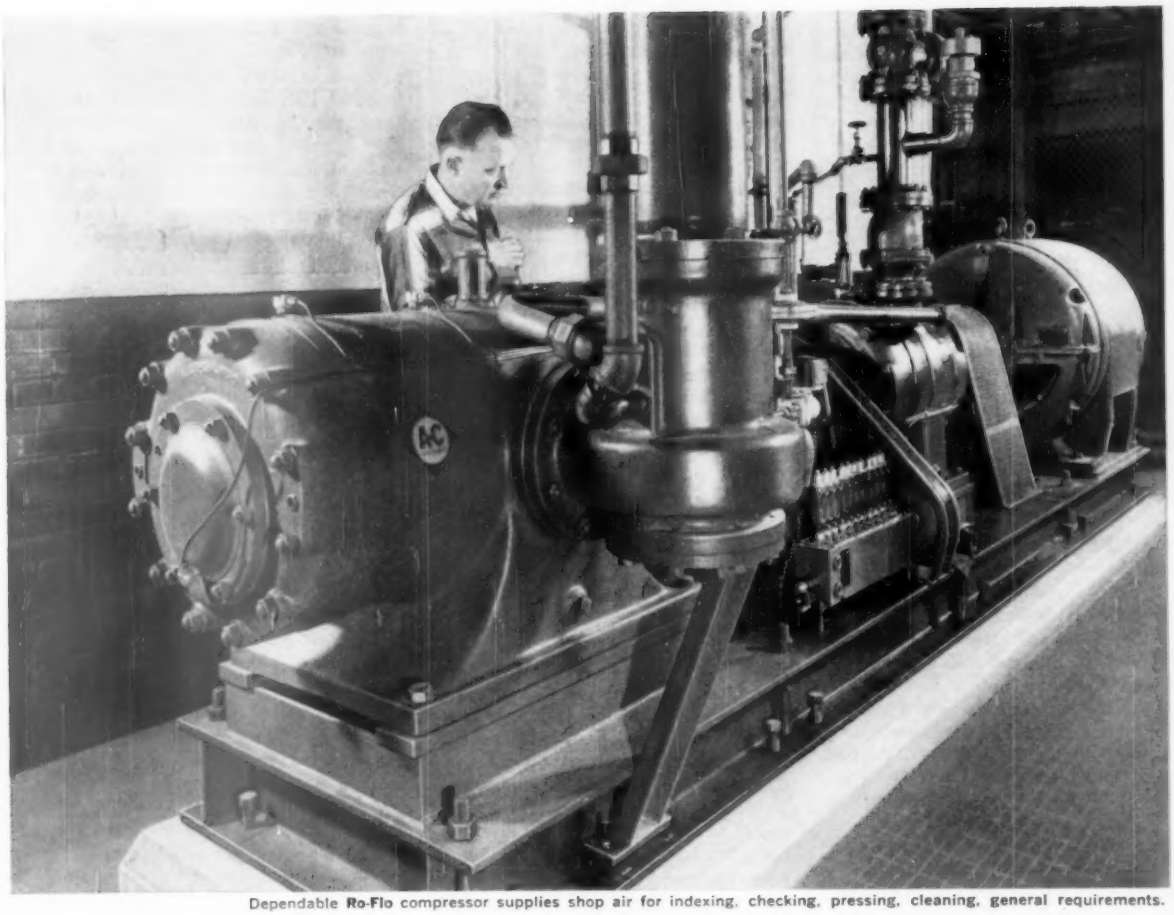

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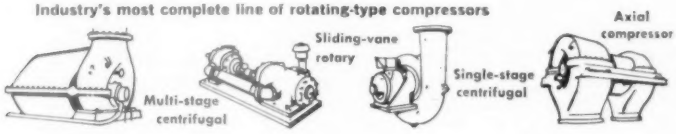

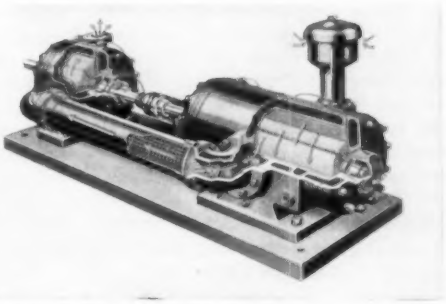

Sliding-vane action compensates for blade wear, helps maintain constant efficiency. Rotary motion cuts vibration and noise, eliminates shock and the necessity for expensive foundations. *Ro-Flo* is an Allis-Chalmers trademark. A-1306

rich the C_3 content of the depropanizer feed has reduced the size of the depropanizer, and also the operating costs. The use of a nonagitated contacter also reduces investment and operating costs. Our unit has these features in its design and during its short operating history they have all proven to be satisfactory.

WEBB, Orlando (Stratford Engineering Corp.): The principal advance in the last year in the case of sulfuric alkylation, with our particular system, has been the reduction in acid consumption, particularly on mixed feed, propylene and butylene, operations. I think that most of the comments I could make are contained in an article in the Petroleum Refiner, September 1959, entitled: "Alkylation Now Goes After Propylene" by Webb and Putney. As shown in the data in that article, essentially 100% propylene can be alkylated in a modern unit at close to design capacity, and consume about 1 lb. of acid per gallon of total output.

Acid consumption varies with the per cent of butylene, and on a straight butylene, the acid consumption on the same type of unit would be more like ⅓-lb. Acid consumption versus per cent propylene has roughly a straight-line relationship for mixtures, 50-50 running about ⅔ lb. This is substantially lower consumption than would previously have been expected for these types of feeds.

TINDLE, A. W. (Universal Oil Products): When you worked on C_3 alkylation, did you get any information on the isobutane consumption?

WEBB: We did not have a good opportunity to calculate isobutane consumption accurately. The best information I have is that consumption on straight propylene runs about 1.3 volumes per volume of propylene alkylated. It may be of interest, also, that during long periods of operation where straight propylene has been alkylated, no propane production has been observed. Propane balances on the unit considering the amount of propane in the feed and the amount of propane off the depropanizer, have indicated no propane produced.

BANKS: Is there a suitable method of analysis for determining the water content of spent alkylation acid?

ADAMS: We have a laboratory-analysis method for determining water content of spent acid which is pretty straightforward, simple, and does not require any special equipment. I don't know where it originated or how widespread it is. It simply consists of taking a sample of acid and adding small increments of standardized fuming acid and recording the temperature rise until a peak is reached, which would indicate the absorption of all the water in the sample.

JOHNSTON: We've just used a straight Karl Fischer titration to determine the water content in this acid.

WEBB: Those of you who have copies of the World War II Technical Advisory Committees reports will find a similar method of adding increments of acid and measuring temperature rise.

VERMILION: We use the Karl Fischer method.

YEATMAN: Has anyone done any work in increasing the mass velocity of Kellogg-type cascade reactor up to three times its original design?

ADAMS: We've run ours at three times design feed rate, and the results aren't too good.

BORCHELT, E. T. (Pure Oil Co.): What are the maximum or minimum acid external circulation rates on the Kellogg cascade unit? Has anyone tried the higher acid-circulation rates? The rates above the normal low rates used for simply keeping the acid "sweet" and uniform.

RATLIFF: We have circulated externally up to 1-to-1 ratio, and noted an improvement in acid consumption and alkylate quality in so doing.

Acid consumption

BANKS: What is the acid consumption in propylene alkylation with sulfuric acid? Also, what is the octane and yield of propylene alkylate?

VERMILION: This question runs the whole gamut of information on propylene alkylation. We do not alkylate propylene, but from the various data sources available, I did get some information on it. As Mr. Webb said, the acid consumption now is considered to be in the range of 1 lb. per gal., although many people reported as much as 2 lb. per gal. The yield is, roughly, 1.8 bbl. of alky per bbl. of propylene, and uses about 1.3 bbl. of isobutane. In general, most of the recent units produce a material that is 100% off at 400° F; with an F-1 clear ranging from 89 to 92, an F-2 clear ranging from 88 to 90, and an F-1, plus 1.5 cc., of 100 to 102.

WEBB: These mixed alkylates previously were thought to contain more polymer and heavy isomers, and therefore higher final boiling points. Actually they have under efficient operating conditions run lower than butylenes. You might think that alkylating isobutane with a three-carbon olefin should produce a light material, but prior to the experience of last year, it was generally felt that a higher tail end boiling range would result.

This has not been the case. The straight propylene alkylates have been produced with lower 50% points — around 200° F. compared to 220° F. on the butylenes, 90% points of 260° F. or so compared with 280° F. on the butylenes, and final boiling points of about 375° F. compared to 400° F. on butylenes.

MADDOX, W. T. (The Ohio Oil Co.): What is the F-4 rating on the light alkylate from the propylene alkylation.

WEBB: This material is normally not rerun. Usually it goes directly to motor fuel blending. One sample of 97% propylene alkylate after being rerun to 340° F. e.p. (yield 97.6 vol. %) had an F-4 performance number (4.6 cc. TEL) of 136.2.

BANKS: Has anyone replaced a mechanically agitated alky reactor with a nonmechanically agitated shell and tube bundle or vice versa on a given plant? If so, what results have been obtained in unit efficiency?

JOHNSTON: The reactor stirrers were turned off at the HF alkylation unit at Amoca's El Dorado refinery. We obtained essentially the same results as when the stirrers were in operation. I understand Standard Oil Company (Indiana) had a similar experience.

HARRELL: There has been little trouble reported in this area lately, but we normally recommend neutralization with caustic or phosphates and use a finished product corrosion inhibitor. We would normally introduce Unicor or Unicor LHS into unit distillation column or into the product to storage.

YEATMAN, R. H. (Atlantic Refining Co.): I have a question for Mr. Rose on the effluent treating. I understand you were using a Kellogg flask, or modified beaker test for checking

This is Part 3 of the 1959 WPRA El Dorado, Ark., question-and-answer refinery meeting report. Part 1 on cat reforming appeared in the March 21 issue. Part 2 on cracking appeared in the April 4 issue. Part 4 on treating, coking, and distillation will appear in the April 18 issue.

the effectiveness of the effluent treating system. Did you arrive at your control on that basis? Are you still running beaker tests along with the pH control?

ROSE: We still run the Kellogg flasks, as we call them, and we have set up a series of photographic standards enabling the lab to check the flasks consistently. Now we find that we can get No. 1 or No. 2 flasks, which are the ones on the top, and which are very good, we think, with water at about 160° F. Depending upon how the coker is running, we will run into emulsion problems from time to time. We use water on a once-through basis generally. Sometimes we find that it helps to recycle a bit of that water.

RATLIFF: Is anyone drying his recycle isobutane with spent sulfuric acid and with what results?

VERMILION: One of our plants at Toledo has a recycle dryer using spent alky acid. However, we haven't been able to determine any gain in acid consumption because of this gadget. I think you can be positive that if you are scrubbing the recycle with the acid, it takes out some water, but we've never been able to see it as far as acid consumption is concerned.

WEBB: Only one Stratco unit that I know of has been equipped with a spent-acid dryer working on the de-isobutanizer recycle. No definite benefit accrued, and this operation has been abandoned.

BANKS: Have any benefits been experienced in alkylate quality and reduced acid consumption from increasing the H_2SO_4 concentration in emulsion? Was an optimum acid concentration determined? What was the highest acid concentration attained?

ROSE: In short test runs we've noted no apparent difference over acid-strength ranges from about 88 to about 92%. Unfortunately, we have the added problem of changing feed stocks, beclouding some of our results. We've heard from other people and, in talking with them, they did note an increase in quality with increasing strength, but acid consumption increased uneconomically at the same time.

RATLIFF: We have had some difficulties in bringing a unit on stream with acid that's too high in strength. We feel that 96% is as high an acid strength as we like to use with our designed rate in our unit. When bringing the units on stream, if we replace the acid inventory with 98% acid, then we will come on with about 20% olefin feed to the units until we get the acid strength down to about 96%.

BANKS: How does temperature variation between 40° and 50° F. affect acid consumption, etc.?

VERMILION: I have some data that we have just recently obtained on two runs, with essentially the same high-butylene feed stocks and same conditions throughout the plant, except that one was made at 38° F. in the reactor, and one was made at 50° F. The true alkylate make on the plant for these two tests was 2,623 and 2,630 bbl. per day, so the rates were essentially the same. The propylene and total olefins were about 0.2%, and 1.1%, and amylenes and total olefins were 8.0% and 9.1%, respectively. Material balances were good.

The acid consumption for the test at 50° F. was about 0.43 lb. per gal., versus about 0.37 for the other. That may be clouded somewhat by certain lags in the system; I don't think those numbers are completely reliable, but they are in the ball park. Here is the table of our results for two runs:

Reactor temp., °F.	38	50
Days "lined out" (after "equilibrium")	9	6
Alky produtcion, B/D	2,636	2,623
% iC_4 in effluent	68.9	68.4
Acid consumption lb./gal. TA	0.376	0.430
Spent acid strength	90.8	89.8
Total alkylate		
Octanes, F-1 clear	95.3	95.7
+ 3 cc.	107.9	107.1
Octanes, F-2 clear	92.0	92.1
+ 3 cc.	106.6	106.6
% off at 338° F.	94.7	95.0

OTTENWELLER, Jerome H., (Cities Service Refining Corp.): What olefins were you running in that last test?

VERMILION: This was high butylenes, very little propylenes.

JOHNSTON: We ran a test rather recently on our alkylation unit when one of our cat crackers was down. We went to a higher isobutane olefin ratio, and precooled the feed to one of our reactors. We were hopeful that we could not show much octane loss by going from 38° F. up to 56° F. However, the octane decreased from 94.8 to 93.2 when we increased the reactor temperature. The acid consumption was 0.74 lb. per gal. debutanized light alkylate at the 56° F. and 0.5 lb. per gal. debutanized light alkylate at the lower temperature.

NOLLKAMPER, L. M. (Cities Service Refining Corp.): Is there any experience on changing the relative amounts of acid in the emulsion, say going from 50-50 hydrocarbon-acid ratio to, say, 60% acid and 40% hydrocarbon in the emulsion.

WEBB: The tightness of the emusion in the Stratco-type unit is a very important variable. To obtain low acid consumption on mixed feed stocks, it has been demonstrated that it is frequently absolutely necessary to go up in acid content of the emulsion from a nominal 50% type of mixture to more nearly 65% acid in the emulsion. When this is done, a tight emulsion is formed, and other conditions are substantially constant, a very definite and sharp drop in acid consumption is observed, and the alkylate end point drops considerably. The amount of heavy alkylate production is very definitely reduced.

On straight butylene operations, higher acid content and tighter emulsions are also beneficial in quality and acid consumption, but the difference is probably less. The best operations that I know of, on all types of feeds, have the tightest emulsions limited by the settling capacity of the settlers, and the design of them, and also by horsepower limitations on the contactor drivers.

WEBB: On both of these runs to determine the effects of reactor temperature, I'd like to know how long a period was used in calculating acid consumption.

VERMILION: We had about 9 days on one of them and about 6 days on the other after we felt that some sort of equilibrium has been reached.

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Using this new approach, your Dowell engineer can help you avoid treatments that are too small to get the results you want, or are unnecessarily large and expensive. He can help you select the right quantity and kind of acid and addition agents, and the preferred injection rate. Also, he can help you predict probable results from the treatment. He can do all these things when he engineers your treatment with the aid of the "Acid Guide." These three examples have been selected to show just some of the ways you may benefit when the "Acid Guide" is used:

NORTH TEXAS. In Wilbarger County, a low-cost acidizing treatment—engineered using the "Acid Guide"—increased production from a show to 12 boph flowing, on a 16/64 inch choke. The well had been completed in the five-foot Canyon lime pay at about 3870 feet. Treatment consisted of a 500-gallon spearhead of BDA* (Breakdown Acid), followed by 2000 gallons Dowell acid injected at five bpm. Results compared favorably with much larger jobs in similar wells.

OKLAHOMA. In McClain County, an operator saved $2000 in treating materials when he had Dowell engineer a treatment with the aid of the "Acid Guide."

The well had been completed into the Hunton lime in a field where the most frequent treatment was 20,000 gallons Retarded Acid (acid-oil emulsion type). The

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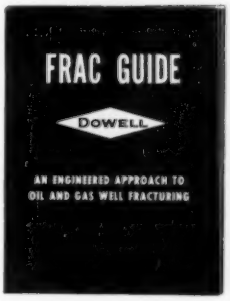

"Acid Guide" was used to see if desired results could be obtained with a less expensive job.

Calculations indicated that 12,000 gallons of fluid would do as well as 20,000. The actual treatment confirmed this prediction. The well went from one boph, pumping, to 10 boph, flowing. The operator considered this result highly satisfactory.

WEST TEXAS. An experiment was conducted on a well in the Strawn lime of Midland County to check the reliability of predictions made with the aid of the "Acid Guide." After a clean-up treatment using 360 gallons of BDA (Breakdown Acid), the well tested 27 bopd. Calculations made with the aid of the "Acid Guide" indicated that maximum penetration with *regular* acid could be obtained with 2000 gallons. A 2000-gallon treatment increased production to 53 bopd. An additional 4000 gallons of regular acid gave no production increase. Then, additional calculations using the "Acid Guide" indicated that greater penetration and more production would result from a treatment using 12,000 gallons of *Retarded Acid*. Following this last treatment, the well tested 84 bopd.

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JOHNSTON: I can't give you a direct answer; we took about 30 days to run six tests.

WEBB: The reason I brought the question up is that it is very difficult to correct for differences in system inventory of acid (tons of acid in the system) during a short test run. It is also difficult to correct for changes in the inventory of moles of acid, that is, the acid concentration. In a normal plant balance, the system inventory is not really replaced by the incoming acid feed since there is a mixing together of the very small amount of fresh acid and the large volume of acid maintained in the system.

By calculus solution we have determined that at the end of 11 days, approximately 50% of the original inventory of acid is still in the system. Hence, any change in operating conditions materially affecting acid consumption has to be maintained for quite a period to allow a new equilibrium to take place in the operation.

VERMILION: You are hitting on a subject near and dear to my heart—the lag in the acid system. In both of these tests, while they were 6 to 9 days long, we had a prior lineout period during which we changed temperatures and watched the effects of the changes in the reactor and the acid system themselves. They were permitted to line out for as much as 2 weeks before we started the tests because of this tremendous lag in the acid system that most people ignore.

WEBB: That is exactly the point. Qualitatively, you may determine from a test run of this type that an apparent reduction in acid consumption has taken place, but as soon as you start getting quantitative, you'd better check your data very carefully.

VERITY: Do you know any cases where the generalization doesn't hold—that the lower the temperature, the better the alkylate quality under all circumstances?

WEBB: We fully subscribe to using lower temperatures, and recommend refrigeration, limiting operation down to 40° F. on all types of feeds.

BANKS: How does acid recirculation rate affect acid consumption and product quality?

ADAMS: I presume this refers to recirculation of acid in a cascade-type system from the final stage, where it is recirculated back to the feed. We're practicing a recycle of approximately 5 or 6 to 1, based on withdrawal or addition rate, and have found that this does decrease acid consumption substantially. Also, the operators like it because it gives them a quicker indication of any problems in the unit that might lead to deterioration of acid strength. We're not too sure why this recirculation is beneficial. We suspect that it gives more uniform acid concentration.

RATLIFF: Perhaps one other benefit from the higher acid recirculation rates here is a higher acid volume in the reaction zones. This is very beneficial to the alkylating conditions.

Product quality

BANKS: Are the conditions under which acid is settled from reactor effluent considered to have an influence on alkylate quality?

ROSE: It's known that if alkylate is allowed to stand in contact with spent acid, unfavorable reactions will occur which will produce heavy polymers. It is thought that most of this is caused by the small particle of acid with a high surface area and it behooves you to get a rapid separation of your hydrocarbon and your acid.

VERMILION: In units such as ours with horizontal settling drums, the lower that the acid is held in the final section of the lower level, the less surface area of acid is exposed to hydrocarbon and the better off you're going to be.

BANKS: In an HF alky unit designed to operate on a C-2 free feed, there are occasions when small amounts of C-2 will get in the feed. What economic methods of removing the C-2 can be recommended? Venting also carries HF from the system and is, therefore, very costly. It is also costly to lose potential C-3 feed in order to keep out C-2. The Oil and Gas Journal (Phelps, Donald E., and Riedel, J. C., "HF Alky Unit Points Some Trends," OGJ, May 4, 1959, p. 85), mentions a three-ton Freon refrigeration system on top of the depropanizer condenser as one method. Does anyone know if a molecular sieve could be used?

KERSEY: Our unit was designed to provide for some latitude in what we alkylate. It can be either operated as a C-4 unit or a C-3-C4 unit. It's provided with a feed splitter that can be operated as a deethanizer or a depropanizer. At the time our unit was designed, we had sufficient C-2 in the feed to require a feed deethanizer, but subsequent to this design, we made changes to the gas plant that allowed us to get a good C-3 recovery, and at the same time a high C-2 rejection. We don't have enough ethane in the feed at present to operate the feed deethanizer as such. We use it as a feed-drying column. But as ethane builds up in our system, it is vented off from the depropanizer overhead accumulator.

Our acid losses over a 3-month period, when run on the same basis of mass velocity through the reactor to give equivalent conditions at the start and end of the acid-consumption tests, were about 0.21 lb. per barrel of debutanized alkylate. I do not believe that at this low acid-consumption rate a refrigeration system could be justified. The optimum method for rejecting ethane would depend on the quantity of ethane in the feed and the facilities that might all ready be existing.

CLARK, E. L. (Linde Co.): I can't visualize any way in which molecular sieves can be used to selectively remove ethane from a propylene-butylene-propane-butane feed.

HARRELL: UOP standard is that ethane in excess of 1% in the propane effluent should be removed by venting. The vent gas then is expected to contain in equilibrium about 5% ethane, 15% HF, and the remainder propane. In other words, it costs 2 to 3 mols of HF to vent 1 mol of ethane. There should be no hazard in venting since material goes to acid-relief scrubber. Where refrigeration is considered, the 1% ethane in effluent propane will probably be the economic starting point for any justification.

BANKS: What conditions are best suited in HF alkylation to prevent formation of organic fluorides in alkylate? Propane produced? Butane produced?

KERSEY: From what we can find out, if you keep the water content of your HF acid below 1%, fluoride content of your streams leaving the units will be tolerable. It is apparently a function of how much water is in your HF acid.

ADAMS: We've also found that low acid strength tends toward formation of more organic fluorides in all of the alkylation products. We've had considerable experience on an HF unit with a fired reboiler in one of our plants. The fired reboiler is a

(Continued on page 143)

Eight 1664 cfm Fuller rotary units compressing to 120 psig in tandem sets to four 700 hp electric motors. Compressor plant supplies 13,200 cfm load to oil refinery—for tools, machinery, air lines and other pneumatic uses.

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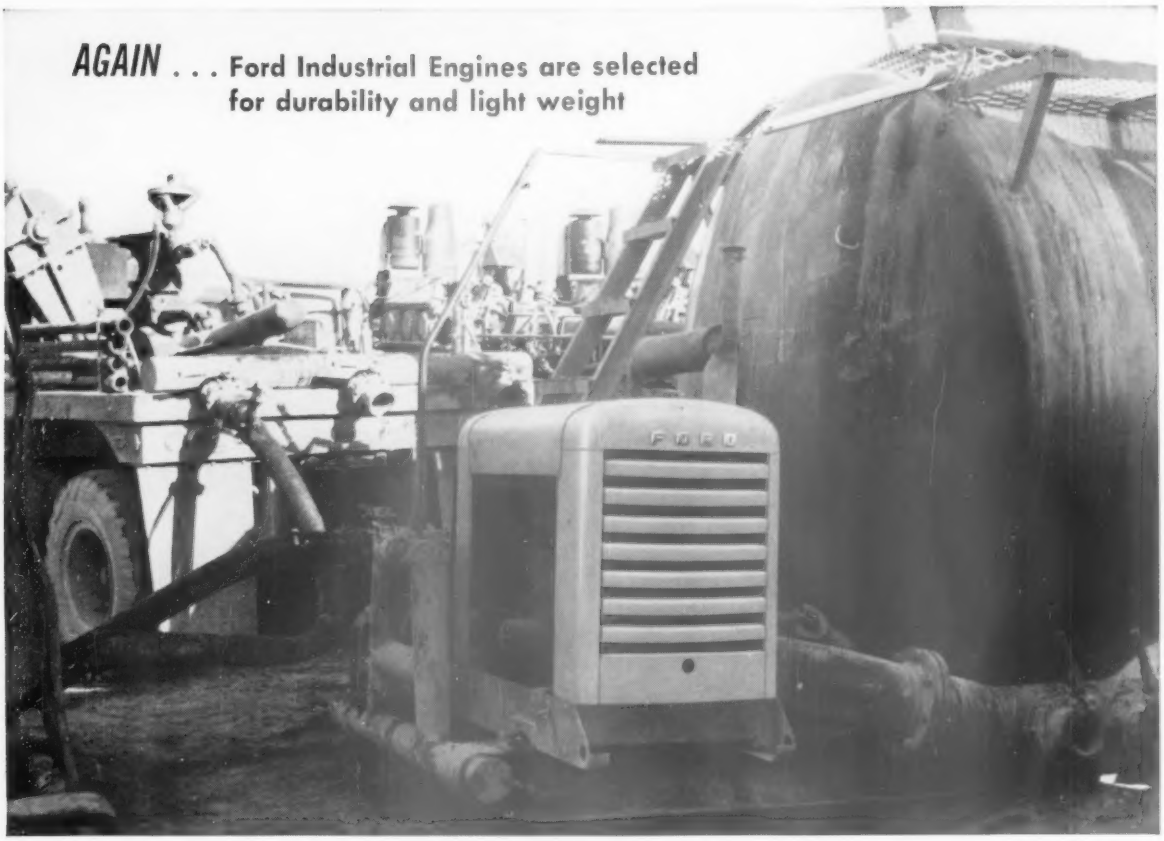

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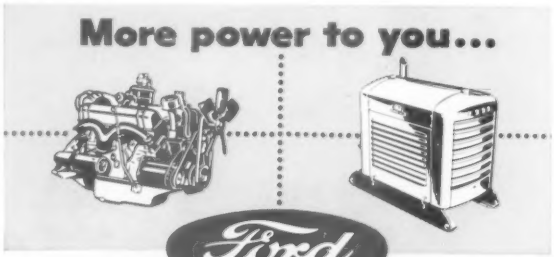

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(Continued from page 138)

method of removing organic fluorides by decomposition, and we have had quite a considerable range of results, ranging from fluoride contents in alkylate from 35 p.p.m. up to 150.

The results vary for no visable reason. We haven't yet succeeded in determining the exact cause for the variation. The butane produced on this particular unit goes to an isomerization unit and the fluorides in the butane were giving us problems there until we installed a sulfuric acid wash system. This acid wash apparently removes the combined fluorides as well as the olefins which we were primarily interested in removing. We've analyzed our propane only once and found there was less than 1 p.p.m. of combined fluoride in it.

BANKS: What is the best method of keeping organic fluoride content of propane produced from an HF alkylation unit to a low point?

VERITY: A fired reboiler.

HARRELL: One direct answer to the question is to keep ethylene out of the feed. Revamp of alkylation feed-prep system is sometimes necessary.

de LOOPER, Harry (Texas City Refining, Inc.): Control of isobutane-olefin ratio is extremely important to keep fluorides down. If we get a low isobutane-olefin ratio we tend to polymerize and fluorides will increase. We caustic-wash our propane-propylene on its way to storage to keep out any traces of H_2S. If you have any H_2S at all it will give you fluoride trouble. We sell propane to a company, directly by pipeline, and we have to keep that material acid free. We caustic wash this product first and then put it through a defluorinator which contains activated alumina.

BANKS: What is the best means of reducing propane organic fluoride content to a satisfactory low content?

HARRELL: UOP has designs on high temperature operation and using special catalyst. If you are interested, you should contact Commercial Development Division.

BANKS: To what limit should organic fluoride content be kept in propane for satisfactory and safe use for home heating?

HARRELL: The direct answer should be "zero" for home heating. For commercial propane it depends on the application or where it would be used.

Corrosion

BANKS: Has anyone been able to effectively eliminate corrosion of alky storage tanks?

ROSE: At our Delaware City alky plant a Kellogg unit, we've had no difficulty outside of losing aluminum floats in our storage tanks. These have been replaced with stainless steel, with no further difficulty. Our feed tanks are of carbon steel. No trouble there. Our product tanks are of floating-roof design, carbon steel. Again, no trouble. Our original wash setup was caustic scrub followed by a second-stage water wash. We have since modified this system to a two-stage concurrent water wash and we adjust the pH of the rejected water, to hold about 6.5 to 7.0 pH. We try to keep it close to 7.0. We also try to keep the temperature of this water up to about 160° F.

Our rerun tower is steam-stripped, and the overhead water is held there at about 7 to 7.5 pH by infrequent use of ammonia. To go back to the water-wash system, we are hoping to further modify this system. We think we can improve it by putting in the needed intsrumentation to allow us to operate in a countercurrent fashion. We have used DEA in our deisotower overhead on rare occasions early in the game when we had our water wash down. We believe that efficient operation of the water wash would solve most of your problems in this regard.

RATLIFF: I might comment on our experience with storage tanks we have had in use on leaded alkylate, or aviation gasoline. We, along with others, have experienced a rather severe pitting in these tanks in the area where the floating roof works and which is alternately exposed to liquid and the atmosphere. We have one tank that was cleaned and protected by a brown enamel manufactured by Patterson-Sargent. It has been on this tank now for 4 years and is doing an excellent job preventing this corrosion.

Our most recent attempt to protect another unit of this tankage was with the use of Di-Met-Coat, which we understand has been used by others in this type of corrosive problem. This Di-Met-Coat was just applied about 1 year ago, and with this short service it is looking all right.

BANKS: Methods of combating corrosion in crude-unit overhead exchangers — corrosion inhibitors, pH control, addition of water wash, etc.

VERMILION: I don't think that anybody can make a fair comparison between sulfuric acid and HF when it comes to acid consumption. In the HF process, the so-called consumption is very much a measure of how well the unit is put together and primarily what the losses of HF vapor are. Acid consumption in sulfuric acid is actually diluted material that goes off to some other plant to be regenerated while the HF is being regenerated within the alky plant itself.

BANKS: What sort of tube-bundle life should be expected in contactors in sulfuric acid alkylation service?

JOHNSTON: We don't have any good life data; in other words, we haven't had a tube bundle corrode out. In fact, our contactors have been in service for about 5 years, and we've removed the bundle several times. The tubes have always been in excellent condition.

RYLANDER, Clanton (Sinclair Refining Co.): We've had a rather severe corrosion problem on our alky contact bundles recently. This coincided with a rapid increase in internal circulation rates. Has anyone had corrosion problems that might be attributed to increased velocities or to an erosion-corrosion combination?

WEBB: I think that generally corrosion experience on bundles in this sulfuric alkylation service is excellent and probably they have a longer life than normal tubular units. The only corrosion experience that I know of in working with a large number of these bundles has been associated in almost every case with a periodical low-acidity operation. If the acidity of the system is allowed to drop below some certain minimum—it might be in the range of 87%—then corrosion would be expected. If it is held, say, above 89%, we have many installations in which Mr. Johnston's experience has been obtained. The relative amount of water in the spent alkylation acid certainly would govern its corrosive properties. I would look for a chemical corrosive attack, rather than any erosion, if the acidities are maintained.

RYLANDER: We've operated with no real corrosion problem for extended periods in the past at essentially the same acidities that we had during the period of severe corrosion. That is why we are looking for some cause other than low acidity.

WEBB: It may also be of interest that the corrosion experience, as you mentioned, is usually on a batch-injection type of installation where acid, instead of being continuously charged

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to the unit, is charged as a slug—an initial inventory—and no further feeding of acid takes place for awhile. Then they dump part of the acid in the system and restore it with fresh, which may raise the acidity back up to, say, 92 to 93%. In this type of batch operation, there have been a few cases where severe corrosion has been reported.

JOHNSTON: The comment concerning water is possibly the most likely solution to this problem.

Feedstock quality

BANKS: How low should sulfur content of combined feed to HF alkylation unit be kept for good operation?

KERSEY: Sulfur content of combined feed to an HF unit should be preferably as low as possible, not to exceed 100 p.p.m. of H_2S. If you keep it below this, you won't have any problems with sour or corrosive products.

HARRELL: Limit on fresh feed is considered to be 100 p.p.m. total sulfur. Lower than this 0.01% total sulfur by weight normally requires no treating. By total sulfur is meant sulfur in any form.

EPPARD, John H. (DX Sunray Oil Co.): We have been considering elimination of caustic scrubbing B-B feed to our HF alkylation unit and we would like to know what the mercaptans we might feed into the unit would do. Does anybody have any good experience with this type of operation?

FLOOR COMMENT: We have tried this from time to time and we find that it helps. You can't keep caustic in any usable strength for a long period of time, and the only thing we could do with a high mercaptan content was to caustic-wash it for an 8-hour period, dump the caustic, and put in new caustic.

CHAVES, William (DX Sunray Oil Co.): Does anybody have any experience on alkylation of amylenes or polygasolines? Either HF or H_2SO_4?

VERMILION: About 13 years ago when I was with Pan American, in Texas City, we made several runs on propylene polymer. The results were terrible. The octane of the material, if I remember, was less than 90. The acid consumption was well over 2.5 lb. per gallon. Incidentally, we started to run a straight propylene polymer and it went so bad so fast that we cut it out and ran half dimer-half propylene polymer. The information I have given is on the half dimer-half propylene polymer run, so that the propylene polymer was far worse than the combination of the two.

WEBB: On sulfuric units, amylenes are usually added to the feed incrementally depending upon isobutane availability; that is, they alkylate the butylenes with the refinery isobutane, and if additional isobutane is available, sometimes they charge amylenes. I'd say that most of the data I have seen involve less than 20 to 25% amylene in the olefin feed. Amylene seems to be, as far as product is concerned, similar to or perhaps slightly better than propylene as an olefin. Of course, many refiners can get all of the C-5's in their motor fuel without alkylation and, therefore, many of them add propylenes today, instead of amylenes, to soak up the available isobutane. I believe that Cities Service has quite a little bit of amylene experience, too.

OTTENWELLER: We have given acid consumptions and qualities and a few other properties of our amylene alkylation when we were alkylating almost 100% amylenes (OGJ, p. 167, Mar. 16, 1959). That was war-time alkylation; it is probably the best data we have. I also might add that we alkylate a butane-butylene dimer mixture from a butadiene plant. That is the principle feed to what we call our butylene alkylation unit.

WEBB: I also intended to mention the attitude of others on butylene-dimer. It is considered to be a very satisfactory alkylation unit feed and behaves apparently like two moles of isobutylene. It, of course, is less desirable than butene-1 and butene-2 as a feed.

OTTENWELLER: This butylene dimer is about 75% C-8 and the rest is heavier than that. Probably about 15 or 20% is C-12 olefins and some is even heavier than that. So we do alkylate a pretty heavy polymer of isobutylene.

Instrumentation and control

BANKS: What instruments are available for automatic monitoring of reactor acid strength? Are they considered satisfactory?

VERMILION: We have been attempting lately to correlate the density of acid with strength and find major problems in differences in density of the spent-acid strength as related to feed stock. You're faced with the proposition of different correlations with different feed stocks.

One of the major problems, of course, is preparing the sample of constant hydrocarbon content and I think that the Hallikainen people have a fairly reliable instrument for stripping the acid to the same degree of hydrocarbon content, so that once that is done, you have a fairly simple job of measuring the density.

ROSE: Tidewater people at Avon worked with Hallikainen to develop an automatic acid instrument. It depends on an automatic hydrometer to determine acid strength and Roger Edwards, our alky plant supervisor who has worked with it, tells me that the intsrument operates very well and it is entirely satisfactory. We don't have one at Delaware City. We separate the hydrocarbon and acid in a separatory funnel using the standard time of 1 hour, and then go ahead and use an ordinary hydrometer.

NOLLKAMPER: We have two such instruments that we have been using for about 2½ years and we have had very good luck with them. We still run lab test as a check against these instruments, but we do operate entirely by the instruments.

We still hold the acid strength manually. We merely use the instrument as an indicator. I think we can hold closer and it certainly helps out when we get into reactor trouble.

BANKS: Summarize the controversy between electrical and pneumatic controls.

ZANDONA: We have evaluated the problem of electric versus pneumatic instrumentation, when we recently constructed a new catalytic cracking unit and crude unit. The decision was made to install an electronic system with pneumatic control valves. The reason for our decision was that we felt we would be able to get a faster response, which I believe, we obtained. We also were limited in our plant instrument-air capacity, and going to electronic instruments, we were able to eliminate the need for additional capacity at that particular time.

We also felt that we would have less maintenance. Now, looking back at our decision, we do feel that we have a fast response. We haven't necessarily been able to maintain low instrument-

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air requirements throughout the plant and we eventually had to purchase an additional instrument-air compressor with the next plant expansion. We do have very low maintenance. We had some problems with the electronic instruments when we first installed them, but it was not the fault of the instrument, but rather the installation.

VERITY: In our business of building plants, it is a general rule that we don't offer electronic instrumentation for foreign jobs. We try to push it in this country, speaking very generally. We still don't feel that it's a good thing to install abroad for plants being designed and built, say, in the next two years.

KERSEY: How long were the instrument leads on your cat cracker where you used the electrical instruments, and how were you able to tell that you did get faster response?

ZANDONA: The unit is located about 150 to 200 ft. away from our centralized control room. We do not have a side-by-side installation to compare speed of response of an air instrument and an electrical instrument.

ROSE: Is there a satisfactory control valve which is electrically operated?

BANKS: There is a paper on electronic controls by Mr. C. D. Gingrich, Regent Refining, Ltd., at our Wichita meeting a year ago, "Electronic Instrumentation At Regent Refining (Canada) Limited's Port Credit Works," Tech. 58-22 (See OGJ, Oct. 20, 1958, p. 77.) which gives reference to this type of valve.

KERSEY: I'm not trying to confuse the situation, but this question can have a rather simple answer. I have one, but I know there are people who will not agree with it. Recently I discussed this question with a representative of a major instrument manufacturer who makes both electronic and pneumatic instruments. It was his company's findings in testing both their electronic and pneumatic instruments that there was no significant difference in speed of response up to about 300 ft. of line from the point of measurement to the place where the controller is located.

Between 300 and 500 ft. is an area which is questionable and can go either electronic or pneumatic, but above 500 ft. they feel it is desirable to go to electronic for normal control problems. Of course, your decision should also be governed by whether you are going to go to data logging or computer control, but for just control circuits this seems to be as simple and logical an answer as I've found.

BANKS: Has anyone experience with electrical-probe type gas flowmeters? Does the thermal conductivity changes introduce sufficient variation to make accurate mass-flow determinations impossible? What have been the problems in maintaining this equipment?

ROSE: We have had an instrument manufactured by the Anemostat Corp. of America. We use it to monitor our flare lines. Our experience with it over the past month has been excellent. We believe it is accurate enough to give us directional indications at very low flows and at higher flows it is fairly accurate. It has been practically trouble-free and we currently have a second one on order for installation in a different location in the flare line, and we will probably install one or two more in some critical location.

I understand these people entered this field reluctantly, and initially there was not much help they could offer people with these instruments. I understand they have just completed a program of calibration and correlation and they can now offer a great deal of technical help and assistance with these instruments.

This instrument is not very expensive. The price ranges between $1,500 and $2,000 depending on the accessories purchased.

WRIGHT: Just to add a word of caution on these instruments. From things I have heard, the probe that is in the instrument does, and can, foul with gases containing hydrogen sulfide, olefinic types gases and other contaminants you may have in the system. If it does, I understand it can still give a good relative reading, but the actual reading is open to question. What is your accuracy, and how was it measured?

ROSE: The accuracy is 5%, measured against slugs of inert gas.

Stream analyzers

BANKS: Has anyone had experience with continuous-end-point analyzers? If so, what about ther reliability, installation cost, and maintenance problems?

VERMILION: Standard of California, Union, and Standard of Indiana, have been using continuous endpoint analyzers, and we installed one about 2 months ago. Installation cost is about $10,000. The results from this one installation, so far, have been very good as long as it is maintained by people that know what they are doing. The answers that the machine gives us have been very readily correlated with the operation of the unit, and have shown us many upsets that the control laboratory has not been aware of. The diaphragm valve in the instrument that we have that is repeatedly failing, but I think that it is just a matter of metal fatigue, and once they get the right metal in there, there will be no particular problem. We are, at this point, very satisfied with it and plan more installations.

The instrument was manufactured by Technical Oil Tool Co. It is continuous. There is about a 13-minute lag behind the actual operation of the unit, but it is a continuous gadget. The instrument is a little distillation column that boils 97% of the material fed to it overhead all the time, and measures the temperature in the pot at the bottom. That correlated very well with the end point from the ASTM distillation.

BANKS: Is anyone using a continuous R.v.p. device for controlling gasoline blends? What about its reliability, installation cost, and maintenance problems?

VERMILION: We use a continuous-vapor-pressure device only to reset butane flowmeter controls. We don't use them for gasoline blending particularly. The major problem is a very long delay.

JOHNSTON: We have a continuous R.v.p instrument, one of Standard Oil Co.'s (Indiana) instruments manufactured by the Precision Scientific Co. We've been using it for gasoline blending and it has been quite a bit of aid to us. It is strictly a record and doesn't control anything; however, it tells us very rapidly when the blend is complete.

FORBES, H. U. (Ohio Oil Co.): We have a vapor pressure controller of another make, and have not had too good success with it. There is a problem in reproducability in that you may have the same vapor pressure on two blends, but they contain different constituents, and the recorder doesn't record these blends at the same point on the chart. We understand that the design is being investigated.

BANKS: What is the extent of use and the success of the following analyzers: (1) initial-boiling-point, and (2) continuous-viscosimeter.

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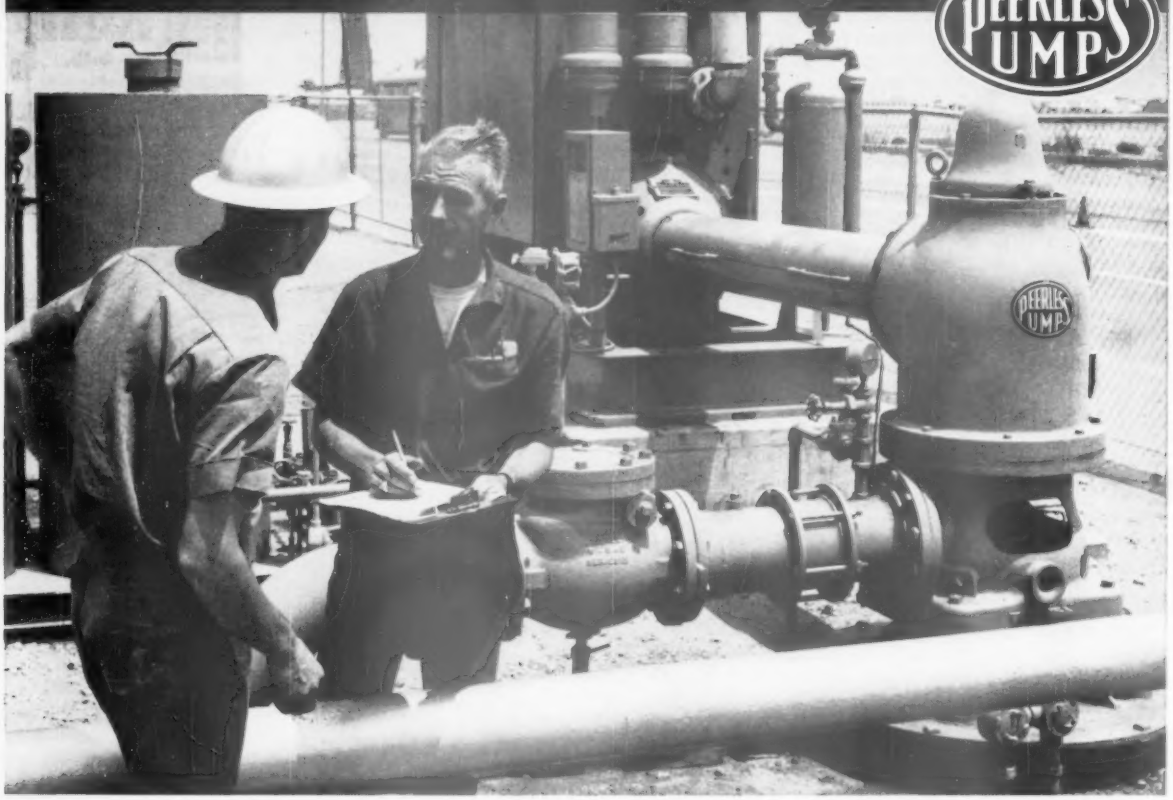

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VERMILION: TOTCO makes an initial-boiling-point unit works on the reverse principle of the end-point analyzer. Union Oil is apparently using one, and we have had one in for about 3 weeks. I know little more about it other than I think we are getting pretty good results from it right now. Our only experience with continuous viscosimeters hasn't been very good.

OLESZKO, T. J. (Aurora Gasoline Co.): We have used the Bendix viscosimter for about 5 years, I don't think we could operate without this instrument, at least not as well. Accurate penetration is maintained on fluxes and asphalt by the operator watching the viscosimeter.

BANKS: Did you work out any "bugs" to get this satisfactory condition?

OLESZKO: No, we measure the viscosity at about 400° F. Actually, at that point, you measure both density and viscosity. The reading is not absolute, since you don't know what the penetration of the bottoms will be but you check that against the laboratory and you use this as a monitor only. When an operator makes a change, or something happens to the plant, he knows that something has happened and he has to make the corrective steps. It is not a controller. The operator makes the adjustments from the instrument record. The instrument is instantaneous. There is no lag except for the lag time between the bottom of the tower and the exchanger where the probe is located, about 20 seconds.

ZANDONA: Do you have a temperature control for the sample going into the viscosimeter? And also, do you use a gold-plated reed?

OLESZKO: No, it is a monel reed and we do not control our temperature other than measure just after the exchanger. It is measured as I remember, between 410°-440° F.

GRIFFITHS, T. V. (Atlantic Refining Co.): We've been working with that same machine on flux to visbroken tar. A rather elaborate sampling system had to be constructed, and we are still working on this in an effort to get consistent results. We had a fair amount of difficulty in trying to hold the temperature on the sample. We are attempting to see what effective visbreaking measurements we can make using this device. So far, we are still getting the "bugs" out of the sampling system.

"Until the refineries accept the fact that they must have a very high caliber of instrument man looking at these instruments, they are going to continue to have lots of trouble."

OLESZKO: I will agree that while you do not get an absolute number, the instrument does give you an indication of viscosity-density change which can be correlated. We do not control the temperature. I know that you get into problems when you are trying to measure at some lower temperature. We have an indication of viscosity or penetration measured at 410°-440° F. but reflecting a penetration at 77° F.

For some asphalts we run one crude, and then for others we blend. We know what the blend is and it is a consistent blend, so I would say we know what is going into the unit for short periods of time, say 8-24 hours. Many times crude changes in character unknown to us. During these times the instrument is most valuable.

BANKS: What success has been achieved in the use of continuous samplers on various process streams?

RATLIFF: We do not have any of these units directly in our plant, but at Cit-Con they have had two continuous samplers in operation now for about 5 years. I talked to some of the boys there before coming up here and they tell me that as sampling devices, they give very excellent results. About the only problem they have had are the usual problems associated with electronic instruments, in that they require some scheduled inspection.

CHAMBERLAIN, J. P. (Delta Refining Co.): Has anybody tried using the specific gravity recorder on the off gas as an operating guide to control the absorber?

MADDOX: Yes, we've had one in for a little over a year. That one is an ARCO, American Recording Chart Co. It is very successful.

BANKS: There was a chromatograph discussed by M. M. Fourroux of Phillips at our Casper meeting entitled, "Automatic Control With High Speed Chromatograph." (See OGJ, Mar. 21, 1960).

VERMILION: We have considerable trouble in the refineries in maintaining continuous analyzer. We have not developed all of our instrument people to the point they can satisfactorily maintain these. Many of them have worked with the ordinary type of controllers, valves, and pneumatic systems that we've had for years, and they have not been adequately trained, nor do they adequately understand some of these maintenance problems associated with these more complex devices. Until the refineries accept the fact that they must have a very high caliber of instrument man looking at these instruments, they are going to continue to have lots of trouble.

ROSE: At Tidewater, in Delaware City, we have almost total automatic logging and scanning, and we have contract instrument people supplied by Panelit, which did the installation. And the way they handle it is to have two types of instrument men. The unit instrument man who services and maintains the miniature Foxboro's that we have, takes care of the control valves, pressure gages and what have you. The superspecial electronics specialist handles the work on the 605 Panelit Data Logger, and any of the other highly complex electronic units that we have. It is fairly impossible, I believe, to roll the two into one. And as instrumentation and controls get more complex the caliber of the man will have to match it.

OTTENWELLER: How about the measurement of yields in using computer control. If these people are taking yields from normal orifice meters, I wonder if they have enough accuracy to even use a computer on them.

VERITY: We are hoping, with the use of these computers, to be able to get cheaper plants, plants that will work more quickly, and one can visualize a plant in which the lags, and so on, have been reduced to the point where the plant would be very nearly inoperable by hand. I think it is looking a little far down the road, but it will make a cheaper plant in that manner to do a given job. That, of course, would offset some of the cost of the computer.

BANKS: Has anyone installed instrumentation to determine water content of poly feed? Has this resulted in improved control of hydration? What were the effects on life and activity?

PERRY, Maynard (Consolidated Electrodynamics): The electrolytic moisture monitor has a possibility of being used on this type of analysis where unsaturates in this particular feed are less than 50%. We like to see, of course, no butylenes at all if possible, and a maximum of 50% propylene. It would all depend to a large extent upon the composition of this poly feed as to whether this particular type of analyzer can be used. It is

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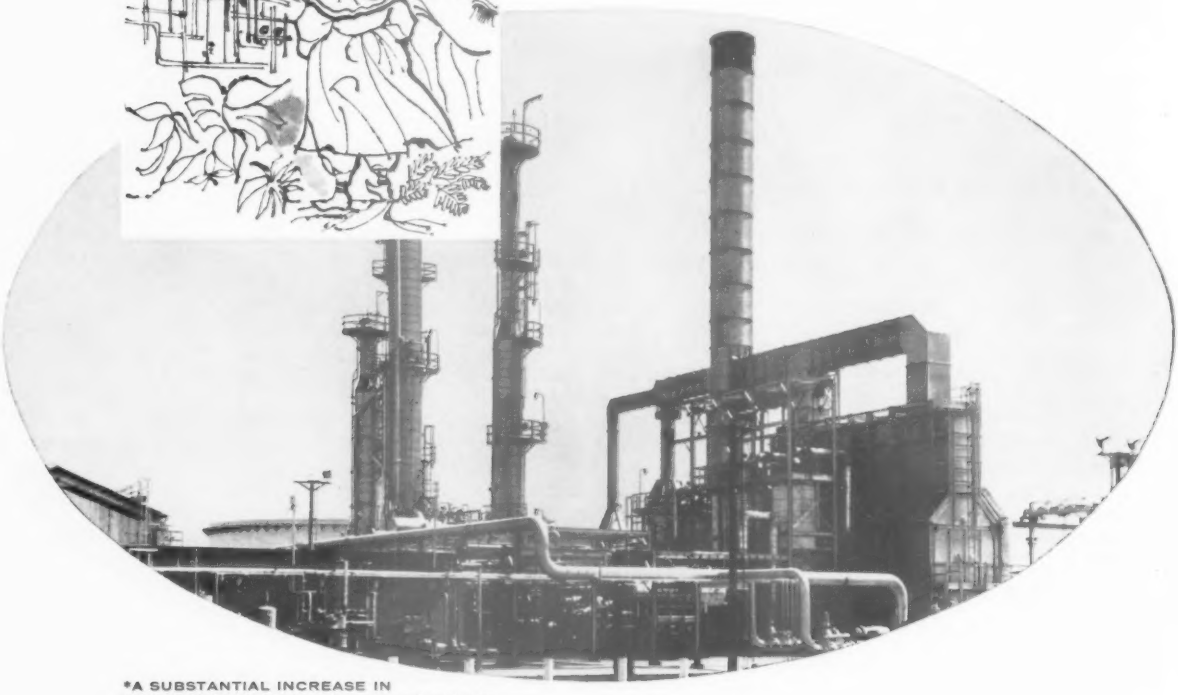

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being used successfully on high-purity ethylene and streams containing up to 50% propylene. Streams with over 10% butylenes are unsatisfactory because they polymerize with the P_2O_5.

JOHNSTON: Can this instrument be applied to liquid streams?

PERRY: We have instruments available with automatic scrubbing systems in front of them whereby you can determine water concentrations in liquid streams such as aromatics and feed to platformers, on the same concentration range—0 to 10 p.p.m., full scale, up to 1,000 p.p.m..

BANKS: What has been the experience with end-point recorders, automatic chromatographic analyzers, and similar new instruments developed for use on operating units?

ADAMS: We have an automatic chromatographic analyzer on an alkylation unit, measuring isobutane loss—and it has been quite reliable. As many of you know on gadget type of instruments, they often get installed and if they are not reliable, the operators will soon get so they don't pay any attention to them. But this one, in fact, has been so reliable that the operators are virtually lost when it is out of service because they have come to use it as their primary guide in operating the fractionating tower that it is controlling.

GRIFFITHS: Does anybody have a completely automatic g a s - chromatograph system with which he is analyzing the light ends in gasoline?

DOWNER: The Phillips system already referred to is not continuous, but a high-cycle-s p e e d instrument. With these new high-speed units, we can have cycle times of 1 minute or less, whereas present day or conventional units cycle in speeds of 3 to 15 minutes. It depends on the type of samples you're using and the operating parameter that is being programed into the instrument. Each process chromatograph is more or less custom designed to its particular application cycle time for any and all streams.

PERRY: There are instruments operating very successfully at present on the depropanizer bottoms in gasoline plants. This is the depropanized gasoline. You can get propane content in the depropanized gasoline 0-1% full scale on a recorder. If you're interested only in the propane, you can get that analysis every 2 minutes feeding the full gasoline sample to the instrument. This is using automatic back flush, of course. It vaporizes the whole sample, and we figure you can go up to about 400°-450° F. end point.

DOWNER: On that full-boiling-range material that we're talking about, there is one instrument which we are now installing which will be on a closed loop control on the bottoms from an absorbing demethanization unit. It will be recording the ethane concentration in the absorber bottoms and based on ethane concentration will be resetting the heat input to the reboiler, in a cascaded closed-loop system.

BANKS: What methods are used in determining quantitatively the total and basic nitrogen in cat cracker feed stock? What method is recommended for the determination of trace quantities of sulfur ($\leq$ 0.005%) in high-boiling oils (459°-800° F.)?

WRIGHT: On the total nitrogen, we use a standard Kjeldahl determination which we modify by titrating the distillate with sulfamic acid with a methyl purple indicator. We use .01 normal acid for a low nitrogens, which are zero to 100 p.p.m.

ROSE: We run total nitrogen by a straight Kjeldhal digestion, and our lab has been able to get good accuracy down to about 50 p.p.m. We run basic nitrogen by UOP method A-313-54, which is a method in which you titrate with perchloric acid after dissolving in acetic acid and benzol. The indicator is a methol violet. We use Fletcher's methyl purple.

HARRELL: The nickel-reduction Granatelli method is probably the one to use for determination of trace quantities of sulfur. This is presented in the new UOP manual.

JOHNSTON: For the sulfur analysis, we use what we term the jet method. We cut back the sample with isooctane, burn the sample in oxyhydrogen flame, precipitate with barium sulfate, and measure turbidity.

VERITY: Does anybody have a method for carbon oxysulfide in gas streams, in parts per million?

ROSE: There are methods which Girdler uses in conjunction with their hydrogen reforming process which are very good in the range of 1-20 p.p.m. Their numbers are SM-DU-5B and SM-71. Mass spectrometry can be used to good advantage in higher ranges.

Computers

BANKS: As for the use of computers for process control, where will they be applied, how elaborate will they be, and give some estimate of the timetable for these developments?

ADAMS: This is an easy one to answer because it is just an opinion—doesn't require any facts. We have currently underway two studies on application of process-computer-control systems—one is a proposed digital system to control the operations of three light-ends conversion units, two alky plants and an isomerization unit. The second study is aimed at applying an analog computer to heat-balance control of a cat fractionator. It is our present feeling that process-control computers definitely have a place in refinery operation, and will find increased application, but there is going to be a period of development, rather than an overnight revolution.

Certainly, the computers are expensive, particularly the digital devices, which of course have the additional advantages usually of logging and data presentation, or data accumulation. Some of them are certainly going to be sold for development and investigation purposes because their payouts are hard to determine except by experience. However, their eventual success will have to depend upon their economic justification a f t e r we've learned more about them.

I think for many processes the current computers will probably not justify the current investment. However, in view of the rapid and intensive development work going on in these areas, we feel pretty sure the next few years will see a great many improvements and simplifications in computer control, and that these devices will be more attractive as these improvements are made.

VERITY: It is sometimes overlooked that if you require data-logging equipment, the additional cost of putting in a digital control computer is not so large because the digital computer gives you the logging facility as well as the control. In other words, the differential between a controller with logging facilities and a simple data logger is a good deal less, possibly, than is sometimes considered. Naturally, we've been looking into this business a great deal, and the biggest problem is the payout.

BANKS: How do you attempt to convince your clients of payout?

VERITY: If you take the recorded data on an operating plant, say, for

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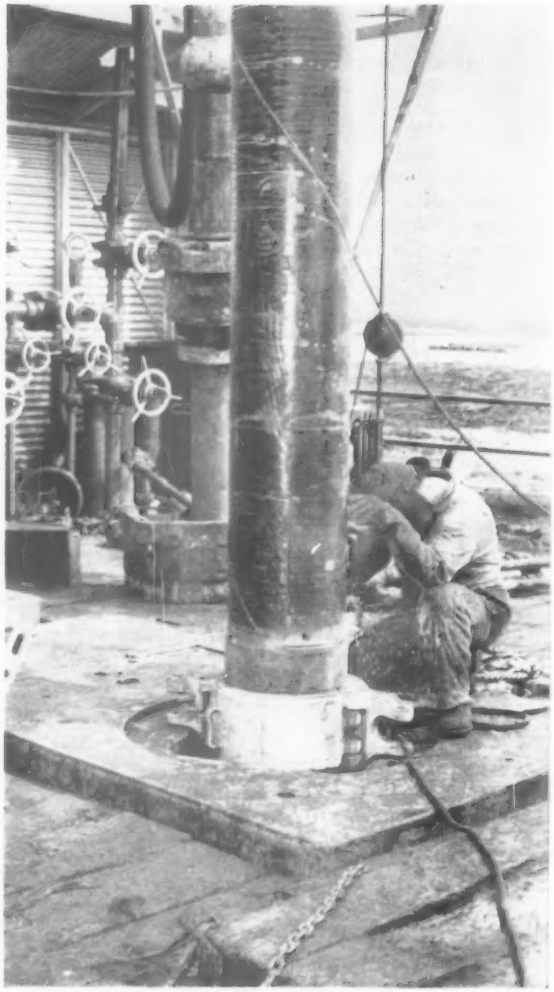

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the last 2 months, and you develop some kind of optimum matrix according to which a controller would have controlled the plant, and then you go back and at random take a number of operating days and find out what actually was done by the plant and what it could have done if you had had the computer in control and then give values to the difference, you can get a payout which should convince anyone except the hardened skeptic. The weakness of the argument, of course, is that in many cases the operators of the plant, if they'd had even a small amount of additional instrumentation, much less expensive than a complete computer, could probably have gotten much closer to the optimum. So the study merely justifies additional instrumentation rather than a computer.

But some studies along these lines have shown payouts for computers varying from 6 months to 6 years, and I believe myself, and I am enthusiastic about these things, that we are going to see more computers in general use and within, say, the next 2 years they will be comparatively common. That is my own feeling.

DOWNER, Whit (Consolidated Electrodynamics): On the process chromatographs which are being used, the accuracy is partly a function of the electronics of the instrument itself, and also the accuracy at which the instrument has been calibrated. True, problems of inaccuracy have been encountered. However, the instruments currently being built are being designed for high speed with reproducibilities in the 99.8% range with accuracies of about 0.25 to 0.5% of scale or range.

Whether this accuracy is intolerable with respect to the rest of the control circuit remains to be determined. But these are the accuracies we're shooting for and are able to hold in an instrument that is well maintained and calibrated at least once a week.

WRIGHT: I think there is a field in the small computers today that many of the refiners overlook. Phillips Petroleum uses a number of simple analog devices which are available on the market today and not too expensive. They perform simple arithmetic function, such as multiplication, addition, or subtraction.

One application was a splitter. The overhead condensers were fin-fan coolers and there was a very wide variation in reflux temperature. Originally Phillips had a "set-flow" of reflux back into the column, and the column was in a continual state of upset due to changes in reflux temperature. A series of these analog devices were to solve the problem. Internal reflux in the column was computed by very simple calculation, and external reflux control was reset to control the internal reflux. (See OGJ, Aug. 3, 1959, p. 68).

MASOLOGITES, George (Atlantic Refining Co.): I am inclined to agree with Mr. Wright. We carried out a very comprehensive study on computers controlling a reforming unit, and when all the smoke cleared away, the economic advantage calculated for computer control, assuming we had all the analytical devices, was not significant.

We've tried to apply these chromatographs to experimental equipment directly. We've put them on the line and obtained answers, but then, after a month or two, have turned them over to our analytical division to develop the techniques.

Polymerization

BANKS: Has anyone observed a correlation of cat poly catalyst life and the technique with which a fresh reactor is placed on line?

ROSE: We screen in our UOP chamber-type unit. We believe that there is a definite relationship between startup procedures and subsequent cat life. We're sure of it. At Tidewater, Delaware City, new reactors are put on line as fast as possible, consistent with pressure drop consideration. We put a man outside at the reactor and his job is solely to check the pressure drop over each bed, and during the startup procedure, we try to maintain less than 10 lbs. ΔP across any bed. We try to quench when we reach about 300° F. until we get full flow established through the reactor. When we feel we are pretty well lined out, we then make the necessary adjustments to individual bed temperatures.

VERMILION: We have loaded catalyst, unscreened, sloppily screened, and well screened, and we very definitely agree with UOP on screening the catalyst well. The other two—not screening them, not doing a good job when you screen them—gave us high-pressure drops to start with, which lead to very short catalyst usage.

JOHNSTON: We condition the catalyst by placing the fresh reactor in the tail position for about 24 hours before putting it in parallel with the rest of the reactors.

WOODSIDE, L. S. (Bell Oil and Gas Co.): On one occasion we ran into some damp weather while changing our poly catalyst case. The loading was hurried by eliminating screening. The initial pressure was low and we experienced a normal run. Since this one occasion we have been charging without screening, being very careful not to handle the catalyst any more than possible. At 90% conversion we will get a run of 160-170 gal. while charging a propane-butane mixture and 60-70 gal. with propane as the charge. Our unit is a UOP five-bed type.

ZANDONA: We've been able to obtain catalyst life of 200-280 gal. of poly per lb. of catalyst on our tubular-type high-pressure units. The technique used is to operate with the lowest possible temperature for the longest period of time, and still maintain the conversion that we want. We'll start at the lowest temperature possible on a new catalyst charge and still maintain a conversion in the order of 90%. We believe this technique to be an important factor in obtaining good catalyst life. It is important to note that our reactors operate until a rather high pressure drops of 100 to 120 psi. occurs prior to changing catalyst.

RATLIFF: In one of our units, specifically the one at Lake Charles, we change the catalyst in nearly every case due to pressure drop. However, in a similar unit (these are tubular reactors; the unit in Lake Charles has the 2-in. tubes, the one in Ponca City has 4-in. tubes) in nearly all cases we have been changing our catalyst due to loss of activity. In both cases the catalyst life—this is on a tetramer operation—is somewhere in the neighborhood of 50 to 65 gal. per lb.

ROSE: What water-addition rate do most people use, and why?

ADAMS: We understand UOP's recommendations are based on maintaining between 15 and 18% free P_2O_5 in the catalyst in the chambers. Their water addition to maintain this is based on the vapor pressure of the water in the phosphoric acid catalyst at various temperatures and the mol per cent water that is required in the feed to maintain an equilibrium condition, plus correction factors based on experience. If catalyst samples taken from the unit are below the 15% free P_2O_5 they are considered too dry, or above 18% too wet. Too dry catalyst is supposed to result in shorter life, carbon formation, and gum in the polymer. Too wet catalyst, I believe, is supposed to have lower strength and will break down and cause higher catalyst high-pressure drop.

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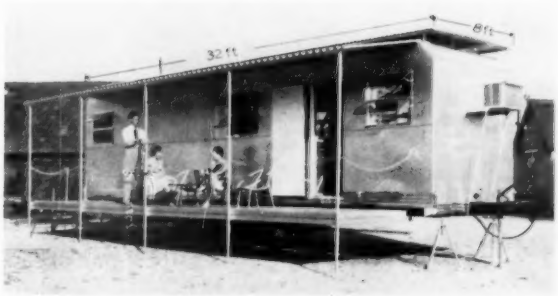

. . . is provided by this English-made unit, a two-four berth unit that is 32 ft. long and 8 ft. wide. The chassis is of pressed-steel welded construction. It mounts on 10.50 by 16 sand tires on twin close-coupled axles. The braking consists of a vacuum servo-system. The body work consists of a steel frame clad internally and externally with stucco-finish aluminum. It provides a 3-in.-thick insulated wall which, the maker claims, gives better thermal insulation than an 11-in. cavity brick wall.

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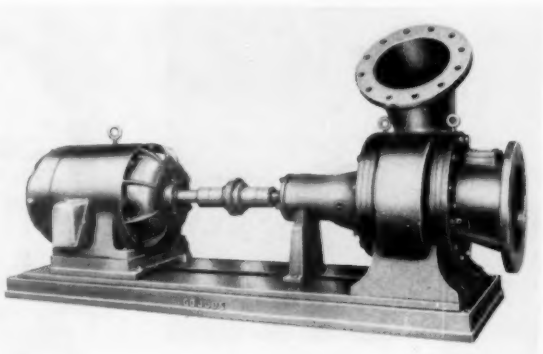

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The pump is of the end-suction, vertically split type. A back pullout assembly lets you get to all rotating parts without disturbing pipe connections. Discharge connection is a 45° self-venting type. Seven types of materials of construction are available, including stainless steel. Delivery: 6 weeks. Approximate net price, f.o.b. factory: from $1,100 for the smallest size to $2,150 for the largest size. This includes pump with bedplate and coupling but not the motor. Source: **Goulds Pumps, Inc., 200 Black Brook Road, Seneca Falls, N. Y.**

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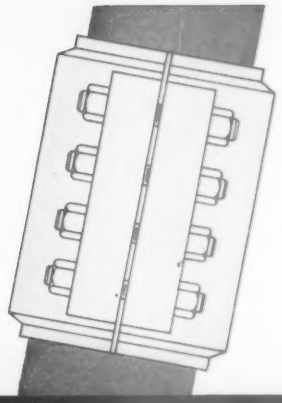

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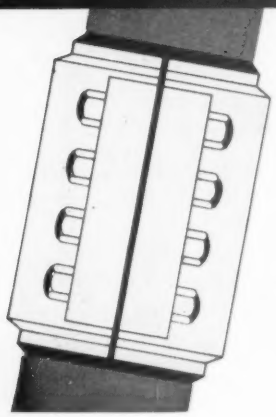

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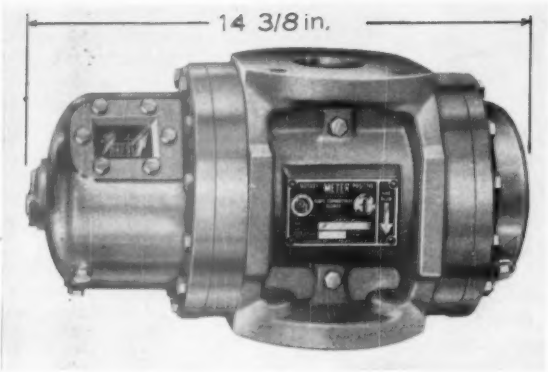

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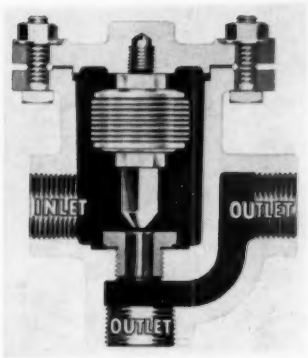

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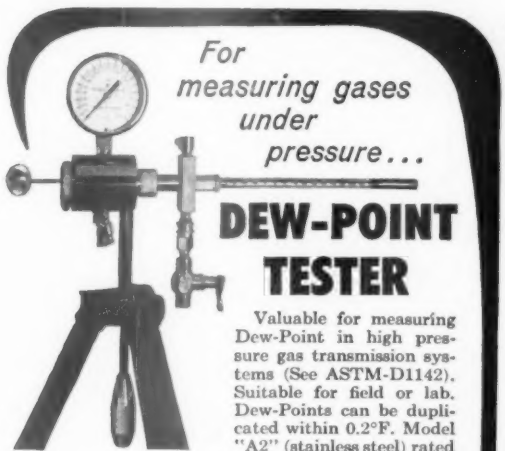

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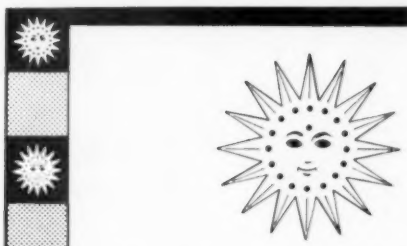
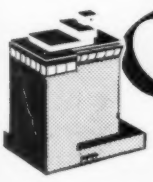


Always, one stands out . . .

Matchless rooms, elegant suites, superlative restaurants, two fine bars . . . air conditioned comfort with magnificent views of the bay, ocean and city . . . conveniently located in downtown Miami near airline terminals, business and shopping.

In Miami, it's the



Columbus
MIAMI'S FINEST HOTEL

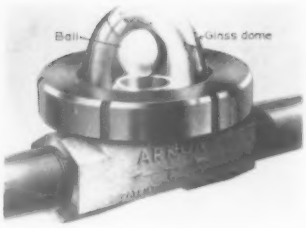
FREE BROCHURE
Address BISCAYNE BLVD AT FIRST
or telephone FR 3-2671, MIAMI

Delivery: immediate. Approximate list price, f.o.b. factory: from $15 for ½-in. to $132 for a 2-in. size. Source: **Clark Mfg. Co., 1830 East Thirty-eighth street, Cleveland 14.**

●

Flow indicator

. . . is easy to see clearly from a distance even in bad light, the maker claims. The indicator is a ball type for low flows—down to 0.075 g.p.m. of water or ½ c.f.m. of air or gas. The



indicator shows at a glance if flow takes place. Flow makes the ball dance in a toughened glass dome. If flow stops the ball drops out of sight.

It is expected to prove useful in air, steam, water, and oil purge lines to instruments and mechanical seals, cooling water to compressors, condensers, jacketed process vessels, lube oil to bearings, and laboratory equipment.

The indicator is made in a ½-in. size for pressures up to 100 psi. with a die-cast bronze body and either a Nylon or Teflon ball. The ball is the only moving part. Delivery: immediate. Approximate list price, f.o.b. factory: $14. Source: **McIntosh Equipment Corp., 15 Park Row, New York 38.**

●

New "MAGIC CIRCLE" PIPE WIPER

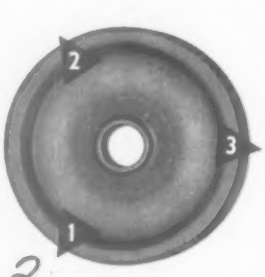
Truly Reversible... ..Two Wipers In One!

"MAGIC CIRCLE"
ring has Extra-Thick Construction...
...GIVES YOU TWO WIPERS FOR THE COST OF ONE!

Field Tested and Proven for over Two Years Under the Most Demanding Conditions!

The new all rubber OIL STATES Pipe Wiper has these exclusive features:

- "MAGIC CIRCLE" inner ring . . . a specially reinforced wiping ring. When one side wears down after miles of wiping, merely turn the "MAGIC CIRCLE" over and you have a new wiping surface . . . TWO WIPERS FOR FOR THE PRICE OF ONE.
- Special Recessed Bowl Design . . . protects wiping lip from the master bushing.
- Special wear resistant Rubber, compounded by OIL STATES Rubber Technologists to resist tearing and abrasion.



3 DRAINAGE PORTS . . . allow mud drainage, keep foreign objects out of the hole.

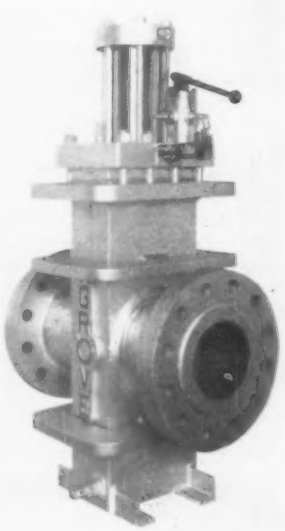
SOLD THROUGH SUPPLY STORES

"OIL FIELD RUBBER PRODUCTS OF MATCHLESS QUALITY"

Oil States OIL STATES RUBBER CO.

P. O. Drawer 152 • Arlington, Texas

OSR-16



Operator and valve

. . . has been developed with fewer parts than conventional types, a sharp reduction in over-all size, and it provides fast operation. Designed for use primarily in natural-gas pipelines, the valve-operator combination's reduced size is brought about by designing the valve stem to act also as a piston rod, bringing the cylinder very close to the valve bonnet. In some sizes the valve bonnet actually becomes the lower cylinder head of the operator.

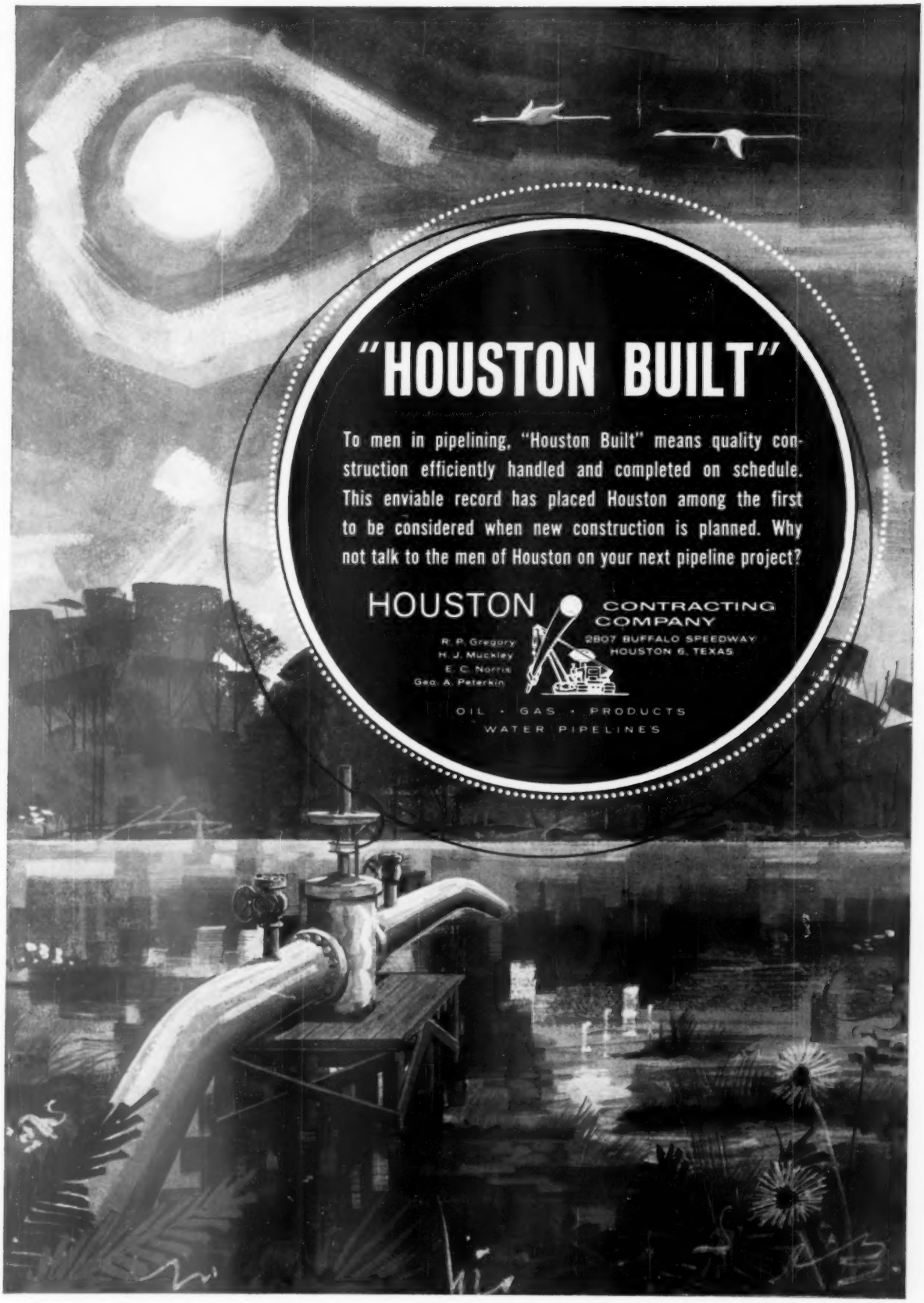
Below the bonnet, the valve is identical with the maker's G-4 gate valve which has a parallel faced gate that slides between floating seats. Source: **Grove Valve & Regulator Co., 6529 Hollis Street, Oakland, 8.**

●

Half-inch sucker rod

. . . available for well pumping is being produced in 25-ft. lengths in Grade 40, a medium-carbon, medium-manganese steel. The maker recommends it

(Continued on page 163)


"HOUSTON BUILT"
To men in pipelining, "Houston Built" means quality construction efficiently handled and completed on schedule. This enviable record has placed Houston among the first to be considered when new construction is planned. Why not talk to the men of Houston on your next pipeline project?
HOUSTON
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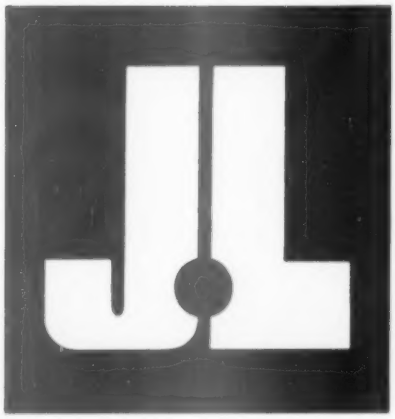
OIL • GAS • PRODUCTS
WATER PIPELINES

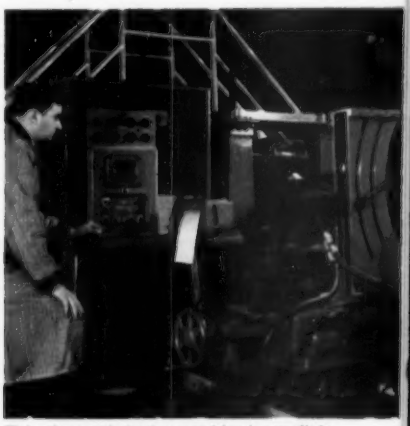
Superior quality 12¾" O.D. J&L Electricweld line pipe was used for 17 miles of this Northern Oklahoma Gas Company line from Cherokee to Ponca City. The line will serve the towns of Ponca City, Perry and Newkirk, Oklahoma, and area industries. J&L line pipe is available in sizes from 6⅝" to 12¾".

General Contractor:
O. R. Burden Construction Corporation, Tulsa, Oklahoma
Contractor for coating and wrapping:
Secrest Pipe Coating Service, Tulsa, Oklahoma

Pipe laying operations with this J&L Electricweld line pipe are fast and efficient. Weldability is excellent. Pipe is 29.28 pounds per foot, .219" wall, X-46 grade.



Reliable field performance is assured because every length of J&L pipe undergoes a specified hydrostatic pressure test which proves its dependability under sustained and surge pressures.



This ultrasonic tester provides immediate pictures of weld soundness in all J&L Electricweld line pipe. It is one of the most advanced control devices in pipe-making.

Quality control at J&L pays off on a job at Cherokee

Every length of J&L line pipe passes over 50 quality tests before it enters the field

Total quality control of J&L Electricweld line pipe is maintained through more than 50 control measures and tests on every length of pipe.

Crush tests assure weld strength and steel quality. A modern ultrasonic device probes soundness of the weld. All joint ends are magnafluxed to assure freedom from flaws. Every length is full-pressure tested under specified A.P.I. or A.S.T.M. hydrostatic test requirements, both in time and degree of pressure. These are a few of the stringent controls that assure complete dependability of J&L Electricweld line pipe.

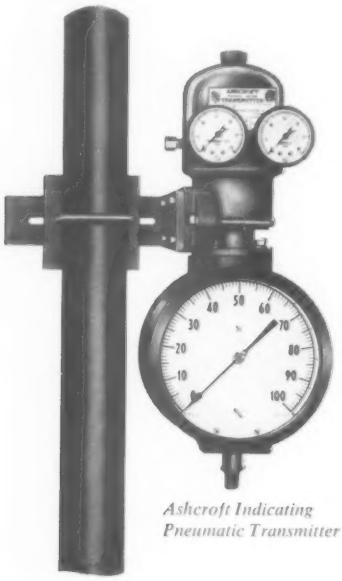
It pays to specify plant-tested, field-proved J&L Electricweld pipe for your transmission, distribution or gathering lines. Write for J&L's new bulletin.

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

signal

ASHCROFT PNEUMATIC TRANSMITTERS give you a true primary and transmitted signal for indication or control



Ashcroft Indicating Pneumatic Transmitter

action

Now—detect with precision accuracy the slightest change in primary pressure or temperature. Transmit this signal quickly to your indicators or controllers. Ashcroft Pneumatic Transmitters achieve these results for you at the lowest initial and operating costs.

Full-range, solid-front indicating and totally accessible nonindicating transmitters eliminate the need for costly high pressure lines, yet permit complete monitoring of process conditions in remote areas.

Narrow-span Ashcroft Transmitters are expressly designed with highest sensitivity and repeatability for the most accurate primary signal feed to controllers. You get better control and purer, lower-cost final products.

Only in Ashcroft Pneumatic Transmitters can you get the wide choice of Ashcroft Duragauge Bourdon tubes or American mercury or gas-actuated systems for sensing pressure or temperature conditions. You also get a time-proven, obstruction-proof, force-balance, nonbleed relay for economical, maintenance-free 3-15 psi or 3-27 psi signal transmission.

Write for factful Bulletins 360 and 361 or ask your nearby Ashcroft Distributor to help you select the right transmitters and receiver gauges for your specific requirements.

MANNING MAXWELL & MOORE INC. TRADE MARK

ASHCROFT PNEUMATIC TRANSMITTERS

A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

SHOWCASE . . .

New Equipment

(Continued from page 158)

for use in handling moderate to heavy loads where little or no corrosion is encountered. The rod is normalized throughout its length to give it a fine, uniform grain structure. Source: **National Supply Co., 2 Gateway Center, Pittsburgh 22.**

●

Newest casing seal

. . . offers high flexibility. Called a U-seal, it uses a compound in which a fungus and bacteria retardent has been added. It maintains a seal regardless of the change in pipe position in relation to the casing—up, down, sideways, in, or out, the maker says.

Its flexibility permits installation on wide ranges of coating thicknesses for any given pipe size. Two stainless steel bands hold the seal in place. Only a screwdriver is needed to tighten bands. You can install the seal two ways: in the new U-shape with the shorter band inside, or with the shorter band on the outside in the maker's Z-shape. Source: **T. D. Williamson, Inc., Box 40, Tulsa 2.**

●

Desert living

. . . in comfort is offered by a new prefabricated building now available from an English manufacturer. The Preline PB 5 building is designed to provide comfortable living for drilling and exploration crews and construction workers. Yet it can be readily moved from one site to another. The building normally comes complete with floor, designed to be laid directly onto level ground. The building can also be obtained mounted on steel skids for fast movement on trucks.

It is of stressed-skin plywood construction. The maker claims a 24 by 12-ft. building can be erected or dismantled by unskilled labor in 2 hours. Since the heaviest panel does not weigh more than 125 lb., the whole structure can be assembled without the use of mechanical handling equipment.

The wall panels are 8 ft. high by 4 ft. wide and of resin-bonded plywood on timber frames. They come complete with prefixed linings and glass fiber insulation between the inner and outer skins. Source: **J. E. Lesser & Sons, Ltd., Green Lane, Hounslow, Middlesex, England.**

S. E. HUEY & CO.

ENGINEERS & SURVEYORS

OUACHITA BANK BLDG.

MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

CROSE

NEW ROAD BORING MACHINE

CENTER SEAT FOR OPERATOR — Sitting in seat located directly over center of machine, operator can keep casing lined up perfectly with hole being bored.

REVERSE-O-MATIC TRANSMISSION — With this new type transmission, operator can switch auger from forward to reverse without engine slowdown. No gear shifting.

HEAVY DUTY TORQUE CONVERTER — For full, constant speed and smooth power flow, eliminating up to 90% of shock load imposed on drive train.

The new Crose Road Boring Machine provides the fastest, simplest, most economical way for boring crossings and installing casings up to and including 42" in diameter. Heavy duty torque converter and reverse-o-matic transmission deliver full, constant speed and smooth power flow . . . let you switch auger from forward to reverse without engine slowdown . . . no gear shifting.

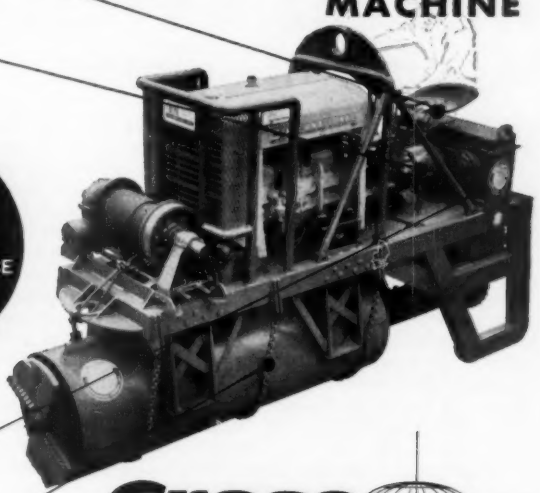
The smaller Model RBA Crose Road Boring Machine is still available for casing up to 24".

WRITE CROSE TODAY FOR COMPLETE INFORMATION

NEW GEAR AND CHAIN BOX — With pressure lubrication feature — has been added to the new Crose Road Boring Machine for greater power capacity.

CASING CLAMP BANDS ELIMINATED — Instead, you use adjustable casing chains which can be easily installed or removed when machine is in ditch.

FIELD-TESTED TOP PERFORMANCE



Crose perrault EQUIPMENT CORP.

2765 Dawson Road • Phone WEbster 6-2171 • Tulsa, Oklahoma •
BRANCH OFFICES: Houston, Texas • Elizabeth, N. J. • IN CANADA:
Edmonton, Alberta • Toronto, Ontario • EXPORT OFFICE: New York, N. Y.

Insulating brick

. . . just put on the market is a lightweight ceramic type for high temperatures. The material is formed in convenient brick size of 2½ by 4½ by 9 in. It is a formulation of aluminum oxide material that is expanded and then fired.

This process creates a cellular structure in which the cells are inter-connected, the maker reports. This permits gas to pass through for purging or evacuation.

The material has the density or weight of a 1,600° F. insulating firebrick and an insulating value comparable to a 2,300° F. insulating firebrick, the maker claims, yet it can be operated up to 3,400° F. Too, it can be cut, sawed, or filed.

Potential petroleum industry uses include as a catalyst carrier, furnace lining, porous ceramic filter, and in absorbing towers. Delivery time: 4 weeks. Source: **Ipsen Industries, Inc., 715 South Main Street, Rockford, Ill.**

•

A selector valve

. . . is now available, called the Model P2-418, in which 90° rotation of the handle actuates both valve components simultaneously and permits reversal of flow direction of two fluid systems through alternate systems. The dual four-part valve is intended for use with chromatographic or other gas-analyzer circuits, as well as with precision test systems requiring simultaneous dual-system control.

Plugging one port in either of the dual valves converts it to three-way operation. The valve is available in either aluminum or Type 303 stainless steel. It will operate at temperatures from −40° to 350° F., dependent upon the O-rings specified. Connections are ⅛-in. NPT. Delivery: immediate. Approximate list price, f.o.b. factory: from $60 for an aluminum to $81 for a stainless-steel valve. Source: **Circle Seal Products, Inc., 2181 East Foothill Boulevard, Pasadena, Calif.**

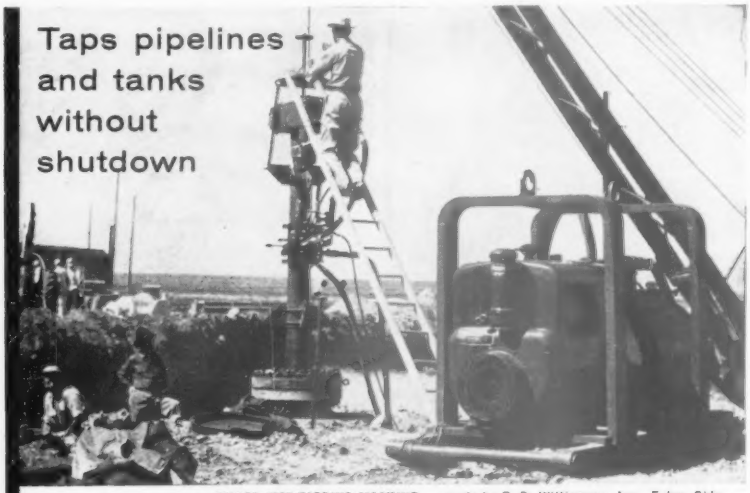
•

Piping systems

. . . which are heavily loaded will be aided by a new hinged expansion joint that makes the lines self-supporting. It promises to prove particularly useful where, because of line size or location, piping systems cannot be supported or anchored by conventional means.

The hinged expansion joint permits a piping system to be entirely self-supporting.

Shear loads can be carried by the expansion joint. And the joint can absorb piping weight, wind loads, and other dead loads without extensive anchoring. The maker's standard model is designed to take rotation in one plane only. For this reason, the joint is used in combinations of two or three. The joint comes in sizes from 3 to 72 in. Delivery: 4 weeks. Approximate price, f.o.b. factory: from $500 for a 3-in. nominal diameter to $2,800 for a 24-in. nominal diameter. Source: **Zallea Brothers, 815 Locust Street, Wilmington, Del.**



MODEL 1200 TAPPING MACHINE — made by T. D. Williamson, Inc., Tulsa, Okla. — permits making of high-temperature, high-pressure taps into oil, gasoline, gas, steam and water lines without time-consuming shutdowns. It is Wisconsin-powered.

WISCONSIN-POWERED
tapping machine

The Wisconsin-powered unit shown enables you to tap any pipeline or tank without first shutting down transfer operations. And it's as simple as 1, 2, 3. You (1) weld an outlet with valve to the line or tank; (2) mount the machine on the open valve; and (3) tap through. It's safe because the cutter head has spring-loaded steel balls that expand, thus retaining coupon when the tap is finished.

Heart of the equipment is the 20-hp Wisconsin Engine, with hydraulic pump and fluid tank. It is tailored to fit the machine and the job. Heavy-duty precision-fitted construction assures smooth-firing power with minimum wear. And its load-lugging power prevents stalling when the cutting gets tough.

Air-cooling cuts engine size and weight, thus making the machine easier to handle. It also eliminates dry-ups and freeze-ups. The result: trouble-free power in sub-zero cold or 140° F. heat — at lowest upkeep cost.

Contact us if you have a power problem. Write for Bulletin S-249 covering the entire Wisconsin line of engines — 3 to 56 hp.

WISCONSIN MOTOR CORPORATION
Milwaukee 46, Wisconsin

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET · TULSA, OKLAHOMA
3420 McKINNEY AVENUE · HOUSTON, TEXAS
806 SOUTH MAIN STREET · WICHITA, KANSAS
Oil Field Distributors for Wisconsin Engines and all types of Utility Units

World's Largest Builders of Heavy-Duty Air-Cooled Engines

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THE WORLD OVER KLM ROYAL DUTCH AIRLINES

THE WORLD'S FIRST AIRLINE

KLM ROYAL DUTCH AIRLINES • 609 FIFTH AVENUE • NEW YORK 17, N. Y.

Just Published!

NATURAL GAS PIPELINE MAP

Completely revised map of Natural Gas Pipelines.

—Lists principle systems with locations of home offices.

—Routes of existing and proposed lines in the U. S. and Canada.

—Gives operators and line sizes.

—Shows compressor station locations.

—Sizes 36"x48".

Price $2.00

THE OIL AND GAS JOURNAL

Reader Service Department

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GO-ANYWHERE VACUUM TANK

For tank cleaning and all-around utility, the Thompson Unitized Vacuum Tank has no equal! Now one driver-operator can handle scores of liquid or semi-solid clean-up jobs, freeing a whole crew for productive labor. Write now and find out how it will save maintenance time and money for **you!** Capacities from 20-100 bbls; skid, truck, semi or trailer mounted.

THOMPSON TANK & MFG. CO., Inc.
2019 East Wardlow Rd., Long Beach 7, Calif.

Sole licensee to Manufacture Vacuum Tanks Under U.S. PATENT NO. 2522077.

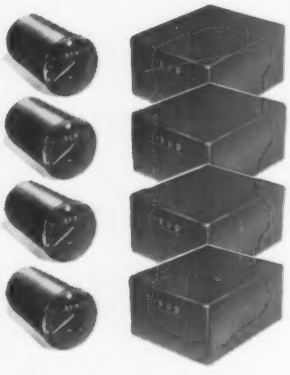
BH100 Series

MILLI-V-METER®

The instrument with the TAPE-SLIDEWIRE

for Petroleum, Chemical, Steel and Aluminum PLANTS

...to accurately indicate



TEMPERATURE
PRESSURE
FLOW
WEIGHT
LEVEL

1/10 THE SIZE, 10 TIMES THE ACCURACY
(of standard instruments)!

These 3x5" and 3"-dia. instruments are used by many manufacturers and laboratories to measure every parameter. Ideally small and matched for panel uniformity, they are completely self-contained...including power supply, servo unit, slidewire and amplifier. They offer digital reading to high accuracy... of the individual phenomenon or of many states through selector switching ...with fast response. Every measurement exhibited on the counter is a definitely calibrated value. Manufactured to MIL-E-5272 and MIL-I-6181 specs.

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7) Operates directly from 60- or 400-cycle power.

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SHOWCASE...

New Literature

Safety handbook

...for plants covers gratings, stair treads ready made to fit most any size, stock lengths of safety edgings, and step bars in various designs. Available now, the 24-page publication contains many illustrations to assist you in adapting safety gratings to special purposes such as work platforms, ladders, gang planks, catwalks, and ramps. Handbook 60 gives a full description of six safety-grating types. Four pages are devoted to safety accessories. Source: **Bustin Steel Products Co., Dover, N. J.**

Process-heating

...problems are discussed in four-page illustrated Bulletin 102.2. It describes how liquid heat-transfer units for heating jacketed equipment of all types can be used to advantage in process industries.

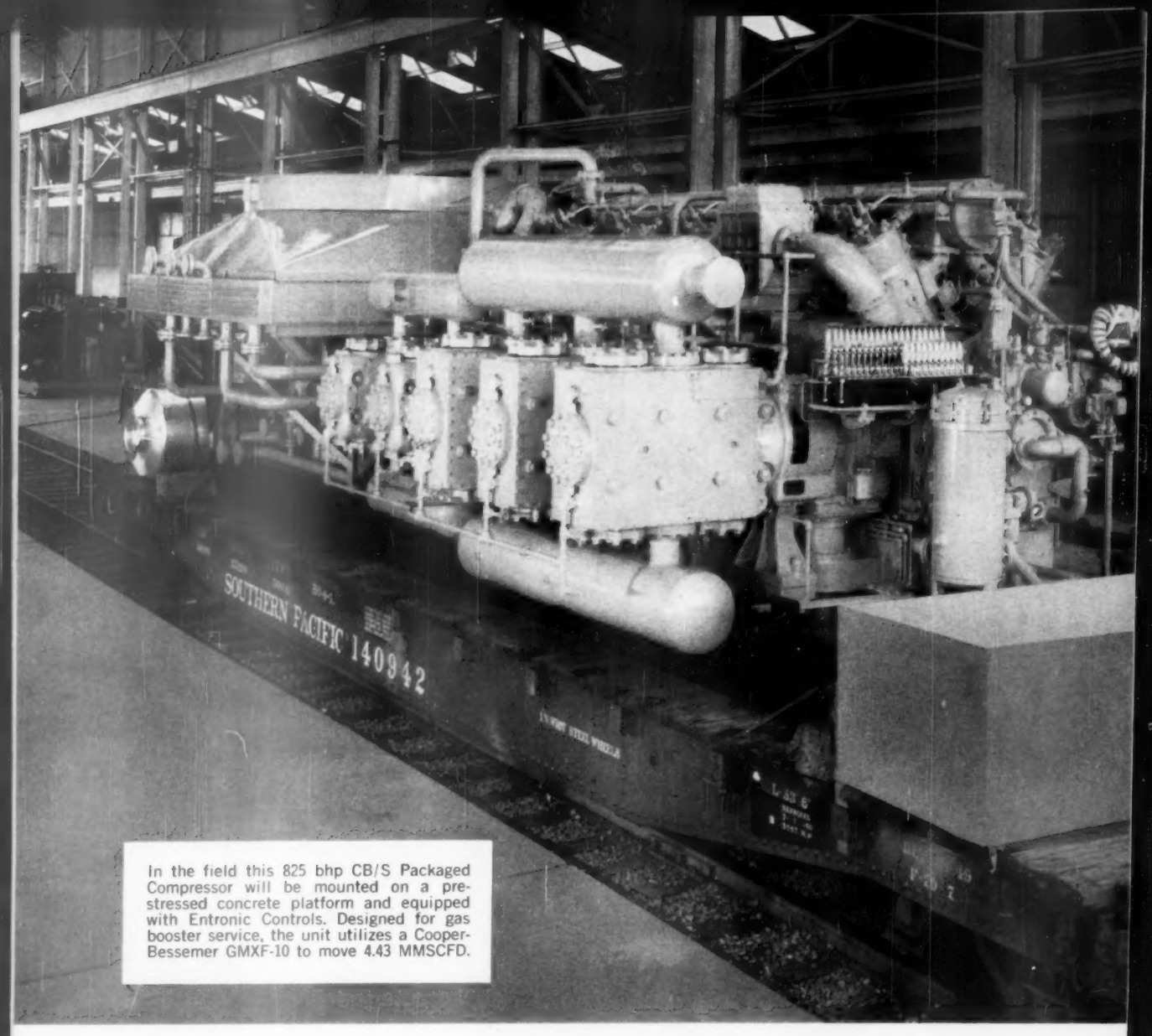
The literature provides illustrated examples of engineered application of packaged heating units in asphalt production, in batch and continuous-process operations, and with Dowtherm units. Diagrams and specifications of heating equipment are also included. Source: **Hynes Electric Heating Co., P. O. Box 1004, Mountainside, N. J.**

Gas-density switches

...used as control and warning devices to monitor pressures or densities of gas or vapors either in sealed containers or in open systems, are outlined in four new technical data sheets. Applications include leakage from electronic-equipment packages, purposeful discharge of charged cylinders, and actuating pumping or refilling equipment. Typical application, dimension drawings, specifications, and characteristics are included on each switch. Source: **Newark Controls Co., 15 Ward Street, Bloomfield, N. J.**

Chemical-processing

...equipment, processes, and services are contained in new 12-page Brochure SA1133 now available. Equipment illustrated and described includes centrifuges, plate heat exchangers, screens, and laboratory devices. The literature gives six basic types of centrifuges along with obtainable sizes. Cross-section drawings describe functional differences between the six



In the field this 825 bhp CB/S Packaged Compressor will be mounted on a pre-stressed concrete platform and equipped with Entronic Controls. Designed for gas booster service, the unit utilizes a Cooper-Bessemer GMXF-10 to move 4.43 MMSCFD.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

CB/S
PACKAGED
COMPRESSORS

CB/S C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

Magcobar Technology Gets

YOU UP

Gets the Hole Down

The shortest distance between two points — spudding in and TD — can be the straight line between the Magcobar planned mud program and drilling economy. If you are responsible for drilling — if it's your well or you're drilling it — you will find that a planned mud program built on Magcobar Technology will help you increase drilling speed and cut drilling costs.

Magcobar Technology can be your best assurance of success. This combination of the right products used right has been proved in every type of drilling around the world. Difficult wells are smoothed out; routine wells are drilled faster and with better production results. You can get to the bottom of most problems by beginning at the top to plan your wells with the Magcobar mud engineer. He will give you a lift on your way up as the drill goes down.

WELL DONE WITH MAGCOBAR TECHNOLOGY
. . . through planned mud programs.

69-223

types. Source: **Industrial Div., De Laval Separator Co., Poughkeepsie, N. Y.**

Floodlighting

. . . catalog just issued illustrates lightweight, heavy-duty, and vaportight cast-aluminum portable floodlights. Ten-page Catalog H also contains new 200 to 500-watt power-beam portables in fire-red finish for plants. Source: **Stonco Electric Products Co., 333 Monroe Avenue, Kenilworth, N. J.**

Thickness testers

. . . which permit measurement from only one side of a wide variety of materials by ultrasonics are detailed in a new 8-page publication. This is accomplished by relating a variation in thickness to the change in resonant frequency, according to Bulletin A-200. Included are specifications and applications for two portable gages—Audigage Models 5 and 6. Source: **Branson Instruments, Inc., 40 Brown House Road, Stamford, Conn.**

Chain and sprockets

. . . brochure has recently been printed. Roller chains described include single and double strand, single-strand heavy series, double-pitch drive and conveyor, double-pitch conveyor with large rollers, and maker's standard attachments.

Photographs and diagrams show construction details and advantages of Taper-Lock sprockets for easy mounting on shafts. Steel plate and bored-to-size sprockets are also listed together with weld-on hubs and bushings for special requirements. One section is devoted to chain couplings.

Complete with selection data and list prices, Brochure A691 also includes general information on installing roller-chain drives, calculation of center distances, horsepower ratings, conveyor engineering, and instructions for lubrication and maintenance. Source: **Dodge Mfg. Corp., Mishawaka, Ind.**

Larger-tank-cleaner

. . . Bulletin 435 describes a high-capacity water-driven unit for quickly and thoroughly cleaning the inside of large tanks. The 4-page bulletin outlines operation of the cleaner, which uses two rotating jets of pressurized hot water to provide scrubbing action.

It shows how the unit can discharge from 4,000 to 9,400 g.p.h., using only a plant's pump and lines at moderate working pressures (114 psi.). Effective cleaning range is given as up to 50 ft.

VERSATILE POWER PACKAGE

DUFF-NORTON RAM-PAC®

HYDRAULIC RAMS AND PUMPS

The Duff-Norton Ram-Pac line provides a versatile source of power to apply from 10 to 100 tons of force in any direction—with little effort.

The twelve rams may be used with the hand or power pumps as portable sources of power for adjusting, testing, bending—pulling gears, sleeves and cylinder linings—pushing pipe or culvert—for heavy moving and lifting. They also are used for permanent installation in hydraulic jigs, fixtures and presses.

The five pumps include two hand pumps, an air-hydraulic pump, an electric pump and a gasoline powered pump. Attachment units, accessories and fittings further increase the versatility of the line. For description and specifications ask your supply store or write for Bulletin AD-90B.

DUFF-NORTON JACKS

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION • Danville, Illinois

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

DUFF-NORTON

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

WHAT 7 THINGS HAPPENED RECENTLY AT FRICK COMPANY* IN WAYNESBORO, PENNA. ?

7 important things for FRICK *and you:*

1. First of all, on a foundation of our 107 years' experience, our new management has established a growth policy that stresses new product development, quality control, and expansion of field services.

2. New branch offices are being opened and the sales-engineering staffs of existing branches as well as of the home office are being increased.

3. A compressor of new design is being developed. This, like our current dependable line, will handle a variety of refrigerants such as Freon, ammonia, propane, butane and carbon dioxide.

4. A new circulating system using refrigerated sea water has been introduced to commercial fishing fleets, at a saving to boat owners.

5. Completely insulated Shell-Ice makers have been "packaged" for convenient field installation.

6. Service to the growing poultry industry has been highlighted by our new counter-flow-continuous poultry chiller, which uses refrigerated water instead of ice.

7. As part of the growth policy, we are increasing the number of Frick distributors. Some of our distributors have been with us 50 years.

All of which indicates one thing: Frick is "on the move!" If you're passing through Waynesboro this summer, stop in and see for yourself; you'll be able to enjoy our remodeled and air conditioned offices.

FRICK COMPANY
Waynesboro, Penna.

*Pioneers in depend*ability* since 1853: air conditioning, refrigerating, ice making and quick freezing equipment, power farming machinery and portable sawmills.

for each jet. The literature also covers other specifications and a listing of accessories. Source: **Sellers Injection Corp., 1606Z Hamilton Street, Philadelphia 30.**

Bonding compounds

. . . and cements together with prices, characteristics, and a list of uses are contained in a new indexed data sheet, free upon request. Separate data sheets are also available on products for corrosionproof construction, electrical insulation, assembling, sealing, and other industrial applications. Source: **Sauereisen Cements Co., 1040 North Canal Street, Pittsburgh 15.**

Mechanical-seals

. . . design-data folder (4 pages) has recently been made available to interested parties. Two nomograms facilitate the determination of frictional heat and power absorption for rotating mechanical seals. Charts give maximum permissible shaft speeds for rotating spring-type seals, along with PV ratings for Type RR Sealol-Flexibox seals. Source: **Sealol Corp., 231 Post Road, Providence 5.**

Gas-regulators

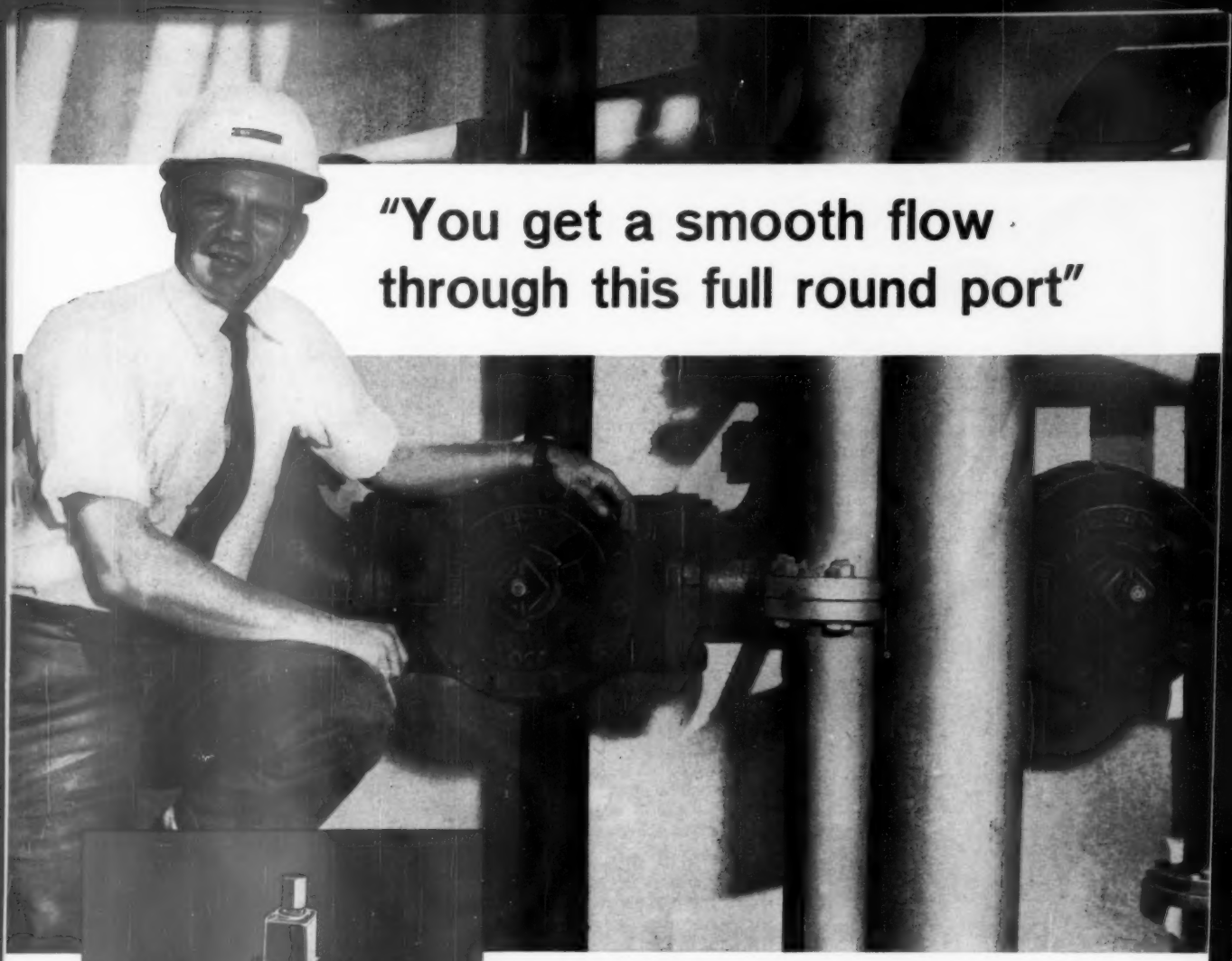
. . . condensed catalog will provide you with a brief but informative summary of regulators, ranging from outdoor gas light and house-service regulators to larger equipment, including pilot-loaded, monitoring, and district-station regulators. Catalog CC-60 (24 pages) includes information on tools and equipment, ranging from orifice wrenches to pit boxes and test stands. Source: **Reynolds Gas Regulator Co., Inc., Anderson, Ind.**

Portable X-ray unit

. . . called Baltograph 300, is detailed in a booklet, which adds complete technical information. The two-page literature piece offers specifications, photos, operating performance data, and recommended uses and applications. Source: **Balteau Electric Corp., New and Meadow Streets, Stamford, Conn.**

Water-conditioning

. . . data sheet entitled "How Corrosion Attacks Industrial Water Systems" is being offered free upon request. It explains how and why boiler, cooling, and process-water systems are constantly plagued by corrosion. Source: **Betz Laboratories, Inc., Gillingham and Worth Streets, Philadelphia 24.**



"You get a smooth flow through this full round port"

ACF lubricated Plug Valves are also available in rectangular, diamond and V ports; venturi, multiport and steam-jacketed models. **Materials:** steel, semi-steel, Ni-resist, carbon steel, bronze, aluminum. **Sizes:** ½" through 30". **Working Pressures:** 125 through 800 pounds.

PRODUCT OF W-K-M's

Creative Engineering

ACF® Round Port Plug Valves

These valves are perfect for heavy ladings because the port is the same size and shape as the connecting pipe.

There are no pockets to trap lading, seating surfaces are sealed away from contact with the fluid flow — and there is no more turbulence or pressure drop than through an equal length of pipe.

All friction surfaces are lubricated for easy quarter-turn operation and protection against corrosion.

Next time—and every time—specify ACF! *Available from leading suppliers everywhere.*

WRITE FOR CATALOG 400

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED

P. O. BOX 2117, HOUSTON, TEXAS

5921

▶▶▶ Equipment Men Notes

Jones & Laughlin Supply shifts

F. B. Barnett

. . . personnel in its field sales force, according to W. L. Wolfe, vice president-sales. F. B. Barnett becomes city sales manager at Fort Worth; O. A. Bergmann takes over as regional salesman—tubular products for J&L's central region; and H. L. Kymen is the new regional salesman—tubular products for the Gulf Coast region.

Barnett joined the division as a storeman at Luling, Tex. in 1953. He was promoted to salesman and transferred to the Dallas office in 1954. Bergmann joined J&L as a special representative in 1943. Since that time he has been with the tubular sales department. Kymen became associated with the division in 1949 at

O. A. Bergmann

H. L. Kymen

Tulsa. He was promoted to salesman—tubular products in 1951 and a year later was transferred to Dallas. In 1955 he was assigned as salesman in Houston in the same capacity.

Other division changes announced at the same time involve: R. Z. Dallas, assigned as salesman at Amarillo; J. W. Snyder, salesman, transferred from Freer to Alice, Tex.; S. D. Bull, assigned as salesman at Laurel, Miss.; J. N. Ryan, salesman at Laurel, transferred to Clarksburg, W. Va.; W. E. Hamon, Jr., salesman at Midland, Tex., assigned to the Dallas city sales office; C. V. Hester, promoted from senior clerk to salesman at Midland; and F. E. Vanderbilt, salesman at Graham, Tex., transferred to McComb, Miss.

Cardwell Mfg. Co. promotes

Jim Flemmons

. . . Jim Flemmons to assistant to J. T. Tucker, general sales manager. Prior to joining Cardwell, Flemmons was a member of the sales division of Republic Steel, and more recently, was district sales representative for Cardwell in the Oklahoma-Texas Panhandle area. Flemmons will headquarter in Wichita.

Meanwhile, Tucker announced the appointment of Bob Hiller as district sales representative in the Oklahoma-Texas Panhandle area. Hiller, formerly with Oilfield Specialty Co., joined Cardwell 2 years ago. He will locate in Oklahoma City.

A. H. Storch becomes manager

. . . of engineering sales, announces C. H. Lovelace, vice president of Crane Co.'s Industrial Products Group. Storch will maintain offices in the Group's headquarters at Crane's Chicago Works. Formerly general sales manager of Chicago Pump Co., Storch served Chicago Pump's parent firm—Food Machinery & Chemical Corp., San Jose, Calif.—for over 12 years in a variety of engineering and administrative capacities.

Halliburton makes four changes

. . . in its field organization, announces Harry P. Conroy, vice president in charge of field operations.

D. J. Sargent has been named assistant division manager for the company's New Orleans division. He was employed by Halliburton in 1937 and most recently served as regional training supervisor. R. W. Graham is the new division engineer in the Denver division. He moves up from assistant division engineer at the same location.

D. J. Sargent

R. W. Graham

John Banister, who has been division engineer at Denver, assumes the post of assistant division manager for Halliburton's Lubbock division. He started with the firm 12 years ago. J. L. Muse has been named testing and tools superintendent for the Oklahoma City division. Formerly he was assistant division manager at Lubbock. Muse joined Halliburton in 1934.

John Banister

J. L. Muse

Representatives tour Baker plant

. . . in Los Angeles. This manufacturing plant of Baker Oil Tools, Inc. was recently visited by California representatives from National Supply Co., Oilwell Supply Co., Continental-Emsco, Howard Supply Co., and Hillman-Kelley Supply Co. Until recently Baker's sale of equipment through supply stores was limited to areas outside California.

Now products handled by supply stores in other parts of the United States are available in California stores. The tours of Baker's Los Angeles plant were arranged to provide an opportunity for supply company representatives to become familiar with the personnel, products, proce-

FRENCH PIPELINERS representing two pipeline-construction organizations in France are visiting Crose-Perrault Equipment Corp. in Tulsa. From left are: Paul Simeon, managing director of pipeline construction for Societe Parisienne pour l'Industrie Electrique; Paul Evans, Crose-Perrault sales engineer; J. L. Guyot, director general of Societe Entrepose; and John Manley, the Tulsa firm's export sales manager.

HYDRO-SPRING TESTER

A combination tester and locked open by-pass operated by vertical movement of drill pipe . . . Aids in the easy, rapid descent of the string and in the elimination of formation and packer damage . . . provides positive indication when tool opens.

EXPANDING SHOE WALL PACKER ASSEMBLY

Minimizes hole drag through use of smaller packer . . . Results in fewer misruns, less rubber left in hole, and more dependability, especially in oversize holes . . . Easier packer release; pulling or jarring is minimized.

BOURDON TUBE GAUGE

Unlike some recording gauges that incorporate packing, the Halliburton Bourdon Tube Gauge is virtually friction-free, for unequalled accuracy and better results in formation testing.

VR SAFETY JOINT

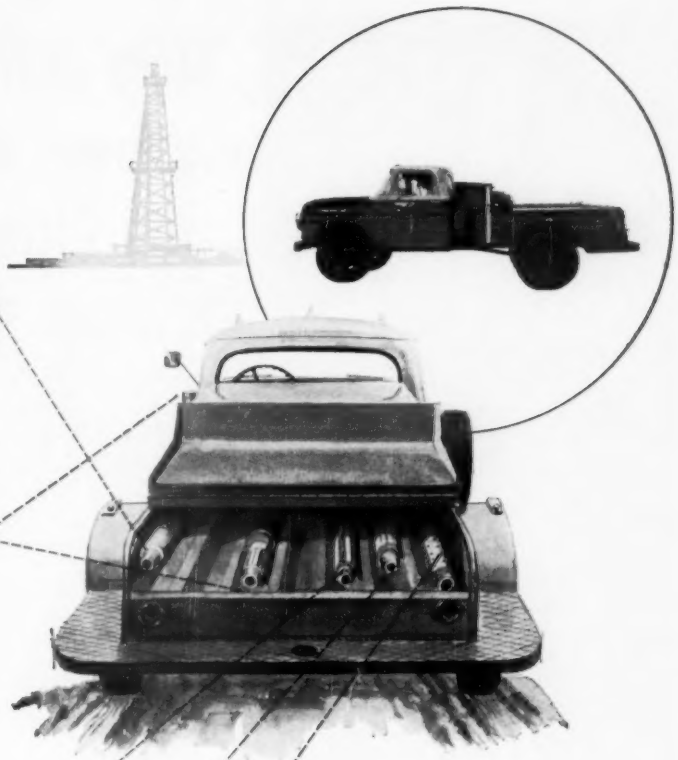
Assists in the removal of drill pipe and testing tools in case either packer or anchor becomes stuck . . . Built-in by-pass provides pressure equalization to aid in unseating packer.

HYDRAULIC JAR

Puts the "striking power" of hydrostatic pressure to work in jarring loose stuck packers and drill pipe . . . saves strain on rig and expensive round-trip time . . . Eliminates rotation and mechanically operated tripping mechanisms.

PERFORATED ANCHOR

Built to withstand the heaviest loads encountered in formation testing . . . Also acts as screen to help prevent plugging of bottom hole choke.



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What ever the nature of your testing requirements, the Halliburton testing truck brings to your well site unmatched testing tools, equipment, and experienced personnel that make well site selection result in better tests. When you specify Halliburton for your formation test, you have the industry's leading tools—and testing personnel—at your service. Put them to work for you . . . for Testing Results You Can Trust!

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TESTING SERVICES

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"CONTINUE TO LOOK TO HALLIBURTON – FOR LEADERSHIP"

More years of protection ...lower evaporation loss with Pittsburgh's Brilliant White TANKHIDE®

TANKHIDE'S special formula—using the finest titanium pigments and weather-resistant vehicles—makes it the toughest, most durable coating you can use on storage tanks. TANKHIDE will definitely:

1. **Reduce evaporation losses,** thanks to its unusually high solar heat reflectance.
2. **Give greater protection** against weather-wear and corrosion.
3. **Maintain its gleaming whiteness longer** because of its self-cleaning action.
4. **Cut tank maintenance costs.**

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IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

dures, and policies that will affect the sale of Baker equipment through the stores.

Paul Bartley elected vice prexy

Paul Bartley

. . . of Black, Sivalls & Bryson, Inc., according to an announcement by Kenneth W. Lineberry, president of the Kansas City organization. Last year Bartley was promoted to general manager of the company's Oilfield Division after serving 6 years as vice president and general manager of Black, Sivalls & Bryson, Ltd., the company's wholly owned Canadian subsidiary. Bartley joined BS&B 22 years ago.

McEvoy makes two appointments

. . . according to C. F. Johnson, vice president in charge of sales. James H. Foster has been named manager of

J. H. Foster

A. C. Oden

the western region where he will be responsible for McEvoy's operations in the oil-active areas of Texas, the Midwest, and Rocky Mountain regions. A. C. Oden takes over as eastern regional sales manager and manager of export sales.

Foster was previously associated with Atlantic Refining Co. and Lone Star Gas Co. Oden, who has been with McEvoy for 15 years, holds several patents on design of wellhead and control equipment for oilfield use.

Core Laboratories promotes

. . . H. M. Shearin and W. P. Schultz from assistant managers to managers

H. M. Shearin

W. P. Schultz

of domestic and foreign reservoir engineering and consulting operations, respectively. The men, both former Humble employes, have been in direct supervision of Core Lab's 54-man reservoir engineering department and data-processing center for the past 5 years.

The advancements follow the resignation of W. L. Horner, vice president, who will assume a management-interest position with George H. Jett, independent oil operator in Shreveport.

Magnet Cove Barium appoints

. . . John E. Lyons, former sales manager of the drilling-mud department, marketing division, to the post of vice president—customer relations for the department. Lyons will be concerned with sales of Magcobar's drilling-mud products at the main offices of United States oil companies who are major customers in this field. Frank Loe, vice president and assistant manager of the marketing division, will assume charge of the drilling-mud department.

J. E. Lyons

Since returning from the armed forces in May 1954, Lyons has held key drilling-mud sales positions with the Houston-based firm, including special sales representative, sales coordinator, assistant sales manager, and sales manager. He first joined Magcobar in January 1946.

B. W. (Bill) Bourne is appointed

. . . a vice president of Delta Tank Mfg. Co., Inc. He had been sales manager of Delta's oil-field-equipment division in Houston since joining the company in 1956. As vice president he will aid in organizing and directing Delta's new direct-sales program and in the establishment of stocking points throughout the south and southwest. Bourne was a 10-year veteran in sales work in the petroleum-equipment industry before joining Delta.

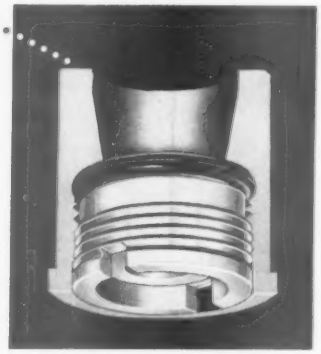
E. S. McRoberts is appointed

E. S. McRoberts

. . . district manager of the Tulsa office of J. B. Beaird Co., Inc., according to Gerald Pope, vice president in charge of sales. McRoberts, who has been with Beaird since 1944, recently spent several years in Caracas, Venezuela as vice president of Beaird International. There he set up sales offices and other facilities.

Robert R. Tyler, vice president of Beaird International, Inc., with offices in Anaco, Venezuela, has assumed McRoberts duties in South America. Tyler will continue to maintain the office in Caracas in addition to his Anaco post. Tyler formerly was with Ingersoll-Rand as a sales engineer.

Smith Threaded Flow Nozzle sectioned to illustrate O-Ring and general construction



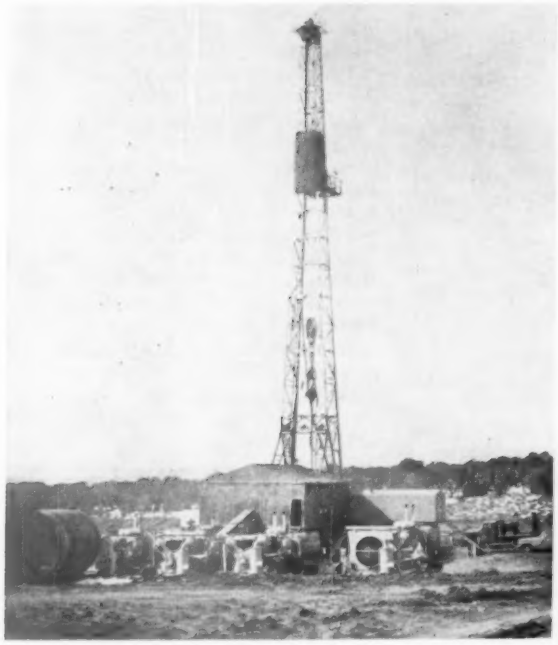
Smith TOOL CO.

(FORMERLY H C Smith OIL TOOL CO.)

COMPTON, CALIF. •

Branches in Principal Oil Centers Throughout the World

THE JET BIT WITH THREADED FLOW NOZZLES



DRILLING with air and foam, Petrol is making hole at its 2 Broad-Gov't. in San Miguel County, Colorado. Dyer Drilling Co. of Denver is the contractor.

Petrol drilled 15,321 ft. of large hole with 20 bits . . .

Air-foam drilling cuts bit costs in mountain tests

DATA RELEASED by Petrol Production Co. of Dallas show that air drilling in the Lisbon trend of Colorado and Utah set new drilling records for the area. In a two-well program, air and foam drilling made 15,321 ft. of large-diameter exploratory hole in just 40 days.

Average life of the 20 hard-formation bits, both 9-in. and 12¼-in., was 766 ft. The nearest conventionally drilled hole required 82 11-in. bits to drill to approximately 6,000 ft. under similar conditions.

Petrol representative at the two wells in San Miguel County, Colorado, was C. D. Medlin. Well Completions, Inc. of Denver supplied engineering supervision and the Tornado compressors and booster for air drilling. Foaming agents and pumps were also supplied by the latter company.

The operator's first exploratory test, 1 Broad-Govt. was located in 19-45n-15w, San Miguel County, Colorado. Loffland Bros. Co., Tulsa, Rig 8, a Wilson Titan, used mud to set 526 ft. of surface casing. Below surface casing, a 12¼-in. hole was air drilled with approximately 4.5 M.M.c.f. of air supplied by four compressors.

With six bits and 15 days of elapsed calendar time, the hole was at 7,983 ft. Average rate of penetration: 497 ft. per calendar day. Average life per 12¼-in. bit 1,244.5 ft. No water was encountered during air drilling. At 7,983 ft., a fishing job was successfully performed with air, using the booster which had been on standby. At this time the operator converted to mud and continued drilling ahead.

Well Completions moved three compressors and a booster about 1½ miles southeast to 2 Broad-Govt. in 30-45n-15w. Dyer Drilling Co., Denver, Rig 2, a U-15, spudded at 10 a.m. on January 22, 1960. Air was the circulating medium in digging the rat hole, as well as to drill and ream for sur-

LOST CIRCULATION?

JELFLAKE

Jelflake® — fragmented plastic foil—is designed to prevent lost circulation, save mud money and hours of costly rig time. Get Jelflake **before** you drill. Condition your mud **as** you drill. Easy to use. Inexpensive. Try Jelflake. Low cost insurance where mud money counts. Jelflake is available at major mud distributors and all Dowell stations.

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DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

face casing. On January 29, with surface casing set at 571 ft., a 9-in. hole was started.

Formation fluid entry required conversion to foam drilling. Flows of water averaged 30 bbl. per hour. Twenty-five calendar days were required to reach total depth of 8,425 ft. on February 22.

Including foam drilling, average rate of penetration for the 9-in. hole was 314 ft. per calendar day. This represented a 36% drop in penetration rate, compared to the dry drilling average of 12¼-in. bits at 1 Broad-Govt. Fourteen 9-in. bits were used with an average life of 561 ft., 46% of the average bit life of the dry-drilled well.

By comparison, the nearest mud-drilled well used 95 bits to reach 9,750 ft., including 13 bits to drill the salt section prevalent in the trend area. Foam chemical costs for the 1,000 gal. of agent used were considerably under mud costs which might have been anticipated for 2 Broad-Govt.

Exploration activity in the Lisbon trend was initiated by the discovery of commercial volumes of Devonian oil and Mississippian gas and distillate in Pure Oil Co. 1 Northwest Lisbon dome wildcat in 10-30s-24e, San Juan County, Utah. Approximately 100 miles southeast, in San Miguel County, Colorado, Pure has an apparent commercial discovery of natural gas in its Pure 1 Govt. S.E. Lisbon in 5-44n-19w. The latter well is approximately 20 miles from the Petrol group.

Good record

ONE RIG in Alaska has a good record since it was shipped north about 18 months ago. Tools of Coastal Drilling Co. of Bakersfield, Calif., have just completed another discovery for Standard Oil of California—its fourth well out of five starts.

The Emsco GB 800 equipment has work for various operators. Last success was the SCU 41-4 which produced 1,870 bbl. daily on initial production at the Soldotna Creek unit. Depth of casing was 7-in. at 10,922 ft.

Total depth of the Soldotna well was 11,315 ft. and it is approximately 2 miles south of the nearest production at Swanson River. Further tests were conducted at an interval between 10,228 and 10,585 ft. in the Hemlock formation. H. G. Vesper, president of Standard, Western Operations, said the well confirms the high hopes held for Alaska's future oil promise. The well is on a 72,000-acre unit. The new oil improves the outlook for construction of a $4 million, 22-mile pipe line from the Peninsula to Cook Inlet.

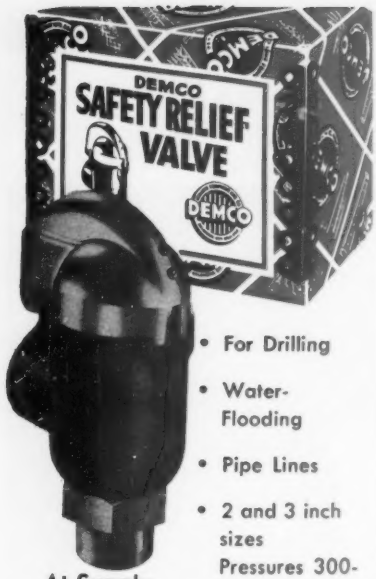
Activity stirs in Spanish Sahara

AFRICA, particularly the Spanish Sahara, will soon get its first American rig. Exploratory drilling will begin in the near future, according to E. C. Babson, manager of foreign operations for Union Oil Co. Union and its partner, Compania Iberica de Petroleos, have three concessions totaling 1¾ million acres. Union has a 70% interest in the joint venture. A drill site will be chosen as soon as seismic surveys being conducted are finished. Babson considers the concessions held by Union and its Spanish partner as choice oil acreage.

Two of the blocks are along the coast line, and the permit includes offshore exploratory rights to the continental shelf or international boundary. Operating headquarters for Union will be in Las Palmas on Gran Canaria Island, 144 miles from El Aauin.

Tidewater Oil Co. and Standard Oil Co. (Ohio) will jointly operate exploration permits covering 5 million acres in the Spanish Sahara. The permit includes eight blocks granted by the Spanish Government.

H. H. Neel, general manager of Tidewater's Foreign Exploration and Production Division, and his staff are making a reconnaissance of the area in preparation for geological work.



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"DEAD MEN THAT HOLD!"

Grip-Tite Pipe Line Anchor Assembly is designed for protection to pipe coating and for permanent hold-downs of all kinds of pipe line construction. Costs only a fraction of cast iron or concrete weights. No heavy equipment needed for installation. They save time, labor and afford protection from heavy weight damage during installation. Thousands in trouble-free use today!

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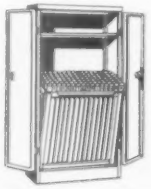
MAP  FILE

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The sturdy MT4 steel cabinet map file has 112 tilting tubes. Easy to file and find maps, tracings and blue prints to 60" lengths. Keeps valuable information dust proof and confidential. Popular everywhere in both field and home offices. Write for illustrated information.

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Corrugated and solid Kraft Fiber Boxes for storing sand samples. Carried in stock.
Core Boxes built to specifications

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TULSA PAPER COMPANY

"Edward Mudwonder Valves keep our Investment down . . . efficiency up"

Lewis Yates, owner of the Yates Drilling Company, Lafayette, La., has proved to himself through his operating records that Edward Mudwonder valves are saving him real dollars. He says:

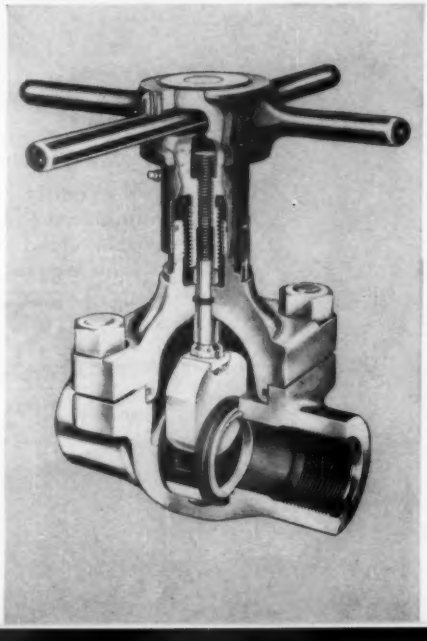
"Actual accounting records on our Rig #1 prove a point I have always believed to be true. The real savings on a mud valve is the money you don't have to spend to keep it in good operating condition. Checking the cost record for Mudwonder mud valves on our #1 rig showed that these valves have required the bare minimum investment in replacement parts. When such is the case, we can give top service to our customers without excessive investment in capital equipment and supplies.

"In short, Mudwonder valves help us keep our costs down due to less maintenance and less repair parts and, naturally, less down time."

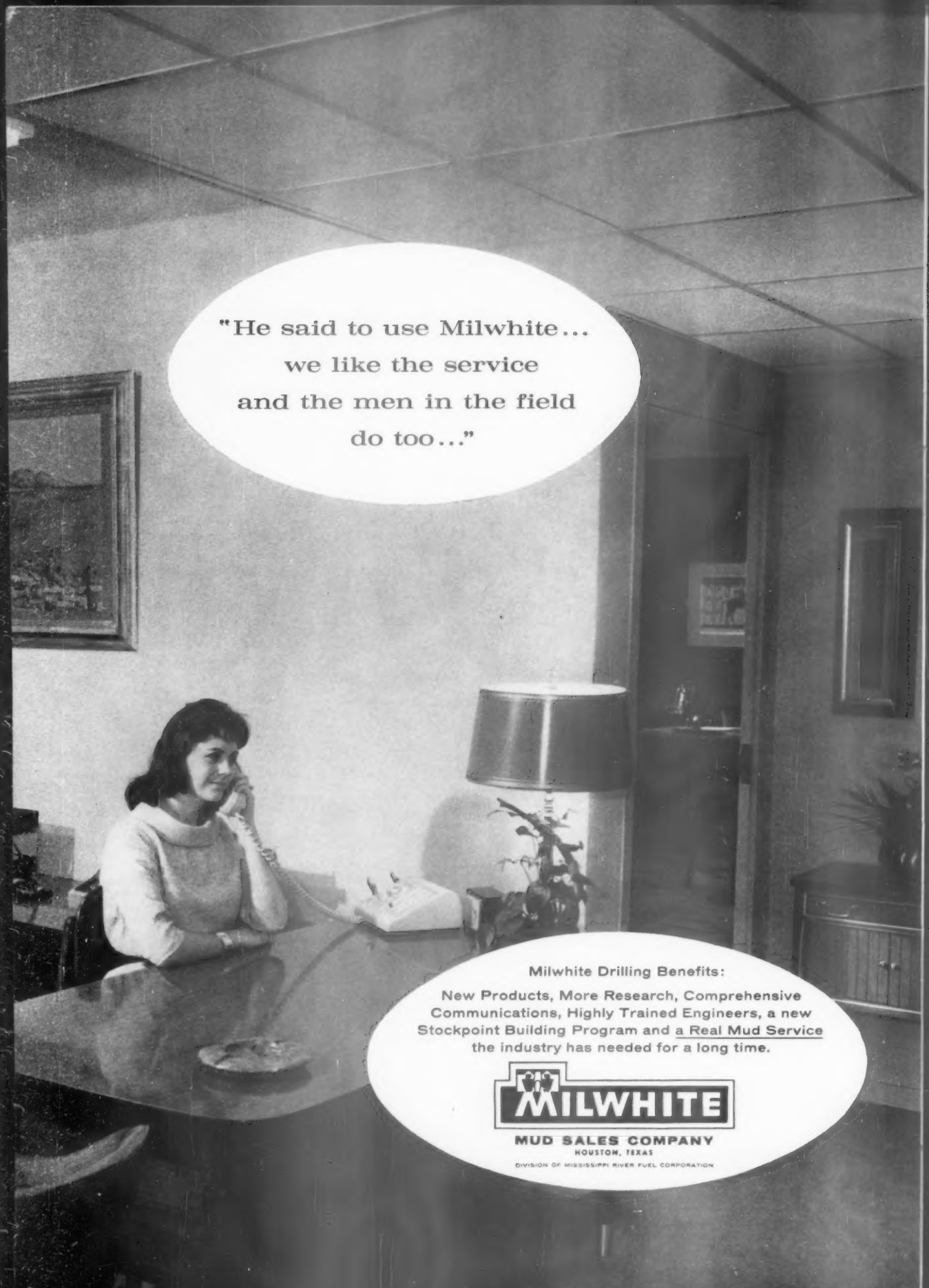
The confidence Lewis Yates has in Mudwonder valves is found wherever you go in the drilling fields. Mudwonder valves are built to 2", 3" and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test), 3000 psi WP (6000 psi test) and in 2" size for 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

▲ Lewis Yates, owner of the Yates Drilling Company, has found from his own accounting records that Edward Mudwonder valves save him money in maintenance and down time costs.



◀ Mudwonder cut-away view shows the one-piece seat insert with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.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we like the service
and the men in the field
do too..."
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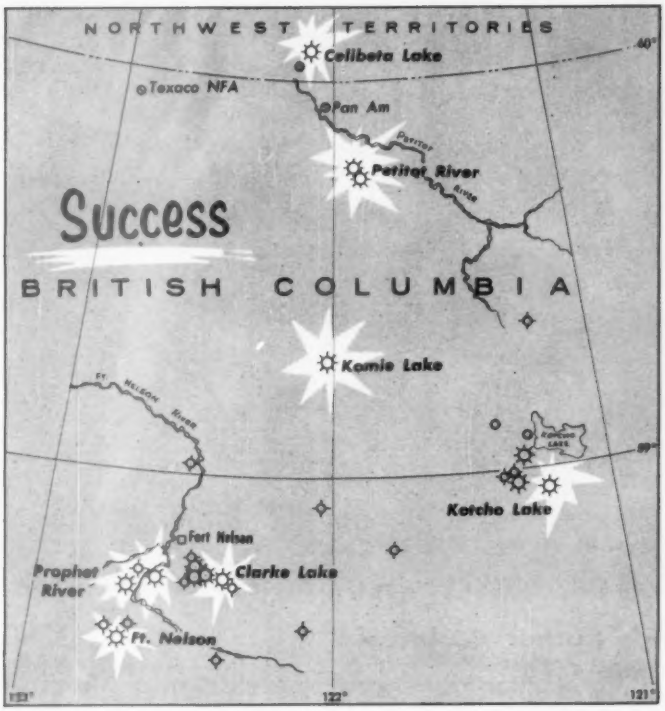
DIVISION OF MISSISSIPPI RIVER FUEL CORPORATION



REMOTE WILDCAT STRIKES, four major extensions, and two key wildcats going down . . . all these events spell one word for Canadian gas hunters: SUCCESS.

Top of the world yields top gas news

BY FRANK J. GARDNER

UP NEAR the top of the world, big things are happening. Suddenly, the northeastern corner of British Columbia has snatched the exploration spotlight away from all other drilling theaters on the continent. And as predicted, the big northward push now has reached and spilled over the border into the Northwest Territories.

Ten days ago, news of four major extensions and two remote wildcat strikes (all gas) hit the Canadian industry broadside. First of the reports came from Home Oil Co., Ltd., operator of the Northwest Territories discovery at 2 Celibeta Lake; then came word of four successful B.C. stepouts from Western Natural Gas Co., Inc., (formerly Gulf States Oil Co. of Canada); and finally, Pan American Petroleum Corp. had a gas strike at its lonely wildcat, 1 Beaver River.

A key wildcat strike . . . The Home discovery was an especially exciting one. For this was the first test of what is reportedly the largest structure yet mapped in western Canada; it was drilled as part of a 1,256,016-acre farmout from Canada Southern Petroleums, Ltd., in 1959.

The 2 Celibeta Lake flowed gas at a rate of nearly 8,000 M.c.f. per day from Slave Point-Devonian rocks at 3,750-58 ft., after drilling to total depth 4,115 ft. Earlier test at 3,774-84 ft. had failed to flow.

This is only the third discovery recorded in the N.W.T. Norman Wells, an oil field, was found in 1920, and Rabbit Lake, a gas field, was found in 1955. The new strike lies about 135 miles southwest of Rabbit Lake; this should give some perspective as to the amount of virgin territory that lies immediately before the Canadian gas sleuth. Exact location of Celibeta is Lat. 60°, 7′, 22″, Long. 122°, 15′, 44″, 8 miles north of the B.C.-N.W.T. boundary, and 30 miles northwest of Petitot River field, a sensational 1959 discovery.

And four big field-stretchers . . . Farther south, Western Natural released data simultaneously on four major extensions to new fields in the Fort Nelson region. Perhaps the most important of these is the first followup to the Petitot River discovery (OGJ, May 4, 1959, p. 141). The No. 2 well, 1¾ miles southeast of the No. 1, made an absolute open flow of 185,000 M.c.f. per day. It lies 70 miles northeast of Fort Nelson. Production here is also from Slave Point.

Second most important of the big stepouts was the No. 4 Kotcho Lake, a whopping 4-mile extension to the two-well Kotcho Lake field. It was here that the Slave Point discovery well in 1959 was described as ". . . one of the larger wells in North America"; it flowed 5,350 M.c.f. on 20/64-in. choke. Some felt that it might well be larger than the Berland River, Alberta, discovery, a 1½-billion-cubic-foot producer. The No. 4 well came in for 9,600 M.c.f. daily (½-in. choke) from Slave Point. It lies 50 miles east of Fort Nelson.

Less spectacular but no less important extensions were scored by Western Natural at 3 Fort Nelson, halfway between Clarke Lake and Prophet River fields, and at 6 Clarke Lake, 1¾ miles east of previous Clarke Lake wells (see map). Both are Slave Point wells.

Plus an unknown quantity . . . Close on the heels of these discoveries came news that Pan American had flowed an estimated 3,600 M.c.f. gas daily on test of its 1 Beaver River wildcat, 66 miles west of Celibeta Lake near the B.C.-N.W.T. border (not shown on map). Here, gas was from a Devonian carbonate; it's the most northwesterly strike in B.C. history and exact age of the reservoir was in doubt, but it lies below 11,424 ft. This wildcat has been 2 years in the drilling, and was the scene of a blowout at 8,520 ft.

Mean big events to come . . . All these discoveries add up to one thing. A new era is at hand for western Canada. And come next winter, these vast northern lands will be the busiest in North America. Add to this the bright luster cast over the Canadian gas business by last week's export approvals, and you come up with only one conclusion: **big** things are happening near the top of the world.

BY CARL H. SAVIT
Western Geophysical Co. of America
Los Angeles

This author declares:

The solution to the problem of stratigraphy has been right under our noses for 30 years. Only recently have we had enough clues, enough incentive, the right kind of equipment, and above all, the proper frame of mind to recognize and accept the answer. Now we can . . .

Use seismic data to find stratigraphic traps

STRUCTURE is the one property of the geologic section which has usually been accessible to the reflection seismograph. By and large, almost all of the world's sedimentary basin area has yielded its buried structural secrets to the seismograph. Rare indeed is the prospect that cannot be explored by the reflection method if enough power is brought to bear on the problem.

Stratigraphy, on the other hand, has only incidentally or even accidentally been determinable by the seismograph. Little harm has come of this lack in the past since enough "structural" oil has been found to supply the world's needs more than adequately. The time is now at hand, however, when any important new oil in many old areas will have to come from stratigraphically controlled traps.

Basically, stratigraphic information has to be information about different **kinds** of rocks. If the reflection seismograph is to distinguish one kind of rock from another it must be by displaying different **kinds** of reflections to correspond to those different kinds of rocks. If we can't tell one reflection from another, obviously we can't tell one reflector (or rock-kind) from another by looking at a set of identical reflections. For structural purposes, of course, it doesn't really matter as long as we can follow a few horizons over the prospect.

Noise, however we define it, has been our villain. Were it not for noise, we could see all reflections clearly by using a "flat" or high-fidelity recording system. Any differences in the shape or size of the reflections would then be open to inspection and interpretation in terms of stratigraphic changes.

In the process of removing noise, seismologists have, in the past, used methods which necessarily have impaired or destroyed the individuality of reflections. Since noise frequencies and reflection frequencies overlap a great deal, any filter which optimizes the signal-to-noise ratio will also remove part of the reflection.[1] To remove some of the frequencies that

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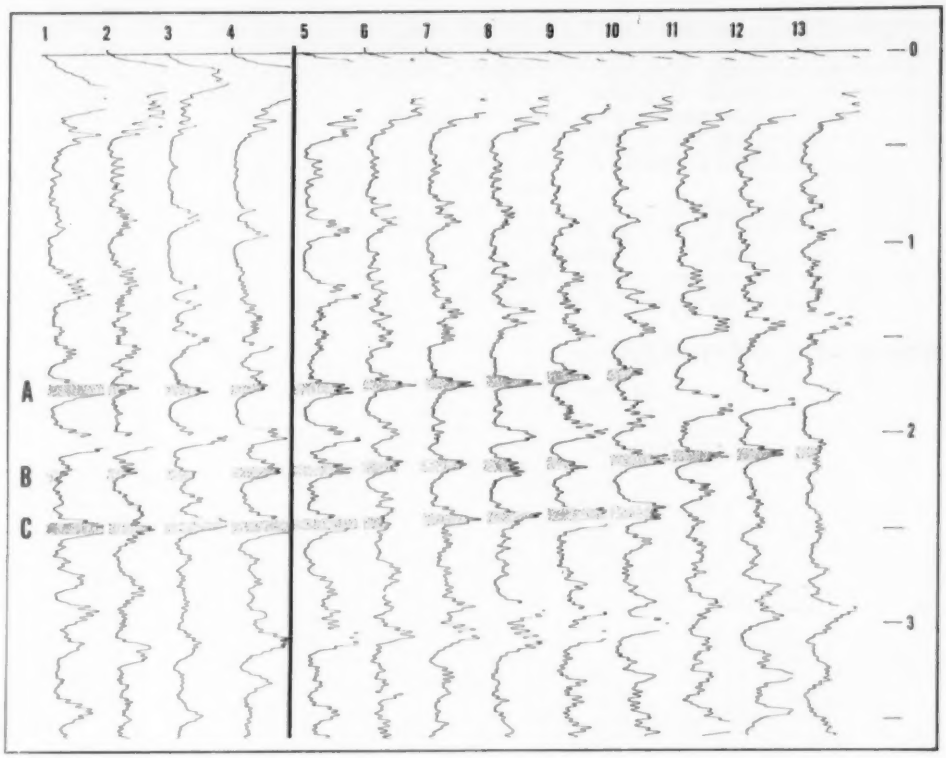


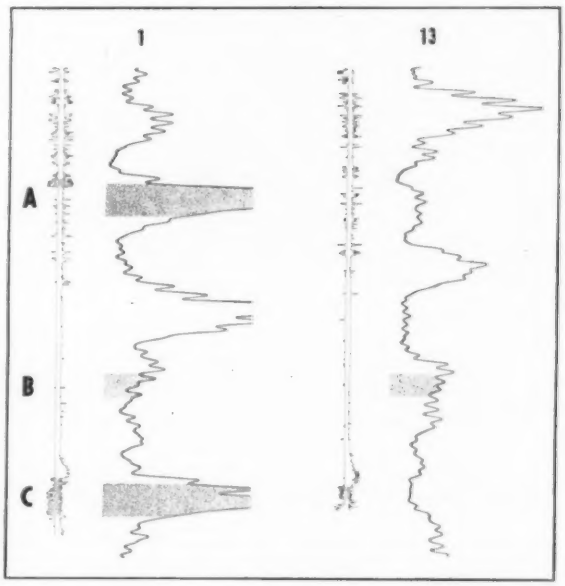
ENERGY trace section from California. Wells are present at locations 1 and 13. Letters indicate reference horizons. Heavy line between locations 4 and 5 indicates a 90° change in bearing.

make up the reflection is to remove some of the individuality or "character" of the reflection.

Also, to keep signals and noise within bounds, we use automatic volume controls (AVC) which tend to make all reflections the same size. We have thus suppressed one more criterion of individuality, namely the size or amplitude of the reflection. Not all of the amplitude-contrast loss can be charged against the AVC since removal of low-frequency components by the filter is also quite an effective means of reducing amplitude contrasts.

It is evident that the answer to our problem is the elimination of filters and automatic volume controls. Unfortunately, when we try this, the result is utter chaos since generally nothing but noise is visible on such hi-fi records. What we need, then, is a method of getting rid of the noise without filters, plus a way of controlling amplitude without suppressing contrasts.

Techniques to meet both of these requirements have been with us for nearly 30 years. The preprogramed expander was in general use for volume control before the AVC appeared. AVC superseded the expander because it was difficult to set the expander properly and many shots were lost. Packing of 24 traces onto a single record also required each trace to stay within narrow bounds. Magnetic recording has reached a stage where expander control of amplitude can make a comeback. Mistakes in setting levels can be corrected on playback.



DETAIL of "energy" traces 1 and 2 compared with corresponding E logs. Seismic horizons A and C are correlative with E-log markers. Horizon C is a clean sand at location 1 but changes to shale and siltstone with some thin sands at location 13. (Illustrations courtesy "Geophysics.")

Of key importance, however, is the nonfilter method of noise suppression. Throughout the past 3 decades we have all known and used the fact that filtered records can be improved by compositing or mixing.[2 3] In fact, in some areas, we can only obtain useful results by extremes of filtering and compositing at the same time.[1] Pattern shooting with multiple phone arrays is an example of heavy compositing.[4] Detailed theories of noise suppression as well as high-fidelity transmission properties of arrays of shots and detectors have been published.[5 6 7 8]

Finally, publications are appearing

which describe the last or keystone step.

To take full advantage of information contained in seismic exploration we must not only use compositing to enhance filtered records but we must use **compositing instead of filtering** to suppress noise.

At first, we must apply this concept in good record areas in which noise is not too big a problem. We should try to see how well we can correlate the visible characteristics of unfiltered reflections with known stratigraphy.

Some examples of the gain to be obtained in stratigraphic information by reducing filtering have been published.[9] [10] One of these[10] points up the need for new modes of data presentation to handle increased dynamic ranges. The philosophy we have outlined here is intended to produce stratigraphic information in our better reflection areas. Eliminating filters obviously is not going to help us in an area where we need both filtering and heavy compositing. We should not, therefore, expect these ideas to help us in areas in which we cannot now get results.

A great deal of experiment and evaluation has yet to be done before stratigraphic mapping is a routine product of seismic exploration. At least, however, the general direction of our path is clearly defined and our experimental techniques appear to lead to an ultimate solution of the general problem.

About the references

The arguments and conclusions in this article are based on field results and theoretical studies in published papers. References are numbered in the text and are listed below. A short resume of the pertinent evidence accompanies each listing.

1. Experimental field records show that signal and noise-frequency spectra overlap. If they overlap too far, the filters which must be used to recover the signal from the noise will materially alter the signal. Mixing can, in such a case, safely recover the signal without alteration.
Frank, Harold R., and Doty, William E. N., "Signal-to-Noise Ratio Improvements by Filtering and Mixing," Geophysics, V. 18, pp. 587-604, 1953.

2. Compositing or mixing was recognized as an effective means of suppressing noise without harming the reflection signal in a U. S. Patent applied for in 1928 and issued in 1931.
Taylor, H. G., "Method of Recording Seismic Waves," U. S. Patent 1779398, Apr. 7, 1931.

3. A mathematical analysis showed that mixing improves the signal-to-noise ratio approximately as the square root of the number of signals mixed provided the noise is random.
Klipsch, Paul W., "Some Aspects of Multiple Recording in Seismic Prospecting," Geophysics, V. 1, pp. 365-377, 1936.

4. In the French Sahara, noise conditions are sometimes so bad as to require shot patterns of 100 shots with seismometer patterns of 108 seismometers per trace. A record and a cross-section show the effectiveness of this combination.
Pommier, Gilbert, and Richard, Henri, "Supermultiplication des Charges et des Sismographes au Sahara," Geophysical Prospecting, V. 5, pp. 282-299, 1957.

5. Signal-to-noise ratios may be optimized by using weighted compositing. On the Edwards Plateau of West Texas and in the Oklahoma Panhandle, "tapered" (weighted) seismometer arrays produced markedly superior records.
Savit, Carl H., Brustad, John T., and Sider, Joseph, "The Moveout Filter," Geophysics, V. 23, pp. 1-25, 1958.

6. Compositing, whether tapered or not, does not appreciably affect the characteristics of a reflection signal.
White, J. E., "The Transient Behavior of Patterns," Geophysics, V. 23, pp. 26-43, 1958.

7. The Russians also reached the conclusion that compositing has no significant effect on reflections.
Issayev, V. S., "Contribution to a Theory of the Directional Effect of a Group of Seismographs in a Case of Pulse Vibrations," Bulletin (Izvestiya) Academy of Sciences, USSR, Geophysics Series, English edition; in two parts, Part 1, 1958, No. 6, pp. 437-443, Part 2, 1958, No. 10, pp. 710-717.

8. An East-German monograph summarizes and compares both the theoretical and field results obtained from seismometer patterns in the West and in Soviet areas.
terns as reported in the West and in the Soviet areas.
Heinitz, Karlheinz, "Das Problem der Bündelung von Geophonen," Freiberger Forschungshefte C66, Akademie Verlag, Berlin, 1959.

9. In a German marsh near the Dutch border, tapered shot patterns and an increased number of seismometers per group allowed a seismic crew to operate with broad-band filters instead of the sharp ones previously used. The resulting improvement in reflection character enabled the interpreters to determine polarity of reflections and thus to separate and identify reflections from the top and bottom of the Bentheimer sandstone. The drill confirmed that the sandstone had been correctly correlated across a fault and followed to pinchout.
Seelis, Karl-Heinz, "Das Reflexionsseismiche Bild des Bentheimer Sandsteines in Raum von Meppen," Erdol und Kohle, V. 12, pp. 953-957, 1959.

10. Preliminary records obtained in California with a device developed by Dott. Ing. Eduardo Merlini of AGIP Mineraria, in Italy, are reproduced in Figs. 1 and 2. Noise suppression is accomplished by compositing 24 traces of a conventional tape-recorded shot to produce one trace in the illustration. Trace amplitudes are representative of the total "energy" received at the corresponding spread. This presentation permits a great amplitude contrast between events.
Events A and C on this section are correlative with electric log markers. Event C represents a porous sandstone zone at location 1 which has silted up at location 13.
An example from Western Canada indicates that the porosity of a particular sandstone can be correlated at three wells with the energy trace.
Savit, Carl H., "Preliminary Report—A Stratigraphic Seismogram," Geophysics, V. 25, pp. 312-321, 1960.

Abo gets hundredth

SOUTHEASTERN New Mexico's Abo trend in Empire field picked up its 100th well. Humble 4 Chalk Bluff Draw Unit in Eddy County flowed 157 bbl. per day through ¼-in. choke from Abo perforations at 5,546-64 ft. Chambers & Kennedy 2 Delhi-Taylor State, Eddy County wildcat, found Abo reef production extending the field 1½ miles east.

Abo production was opened at Empire in 1958 by Pan American. Ten wells were drilled that year. Pan Am drilled more than 70 of the 100 wells in the field, most of them in partnership with Hondo Oil & Gas Co. The other wells were drilled by several operators. Humble has 6 wells.

The first 100 wells are estimated to have an average reserve, recoverable by primary methods, of 600,000 bbl. of oil. There are 12 rigs operating in the field, making it one of the busiest in the Permian basin.

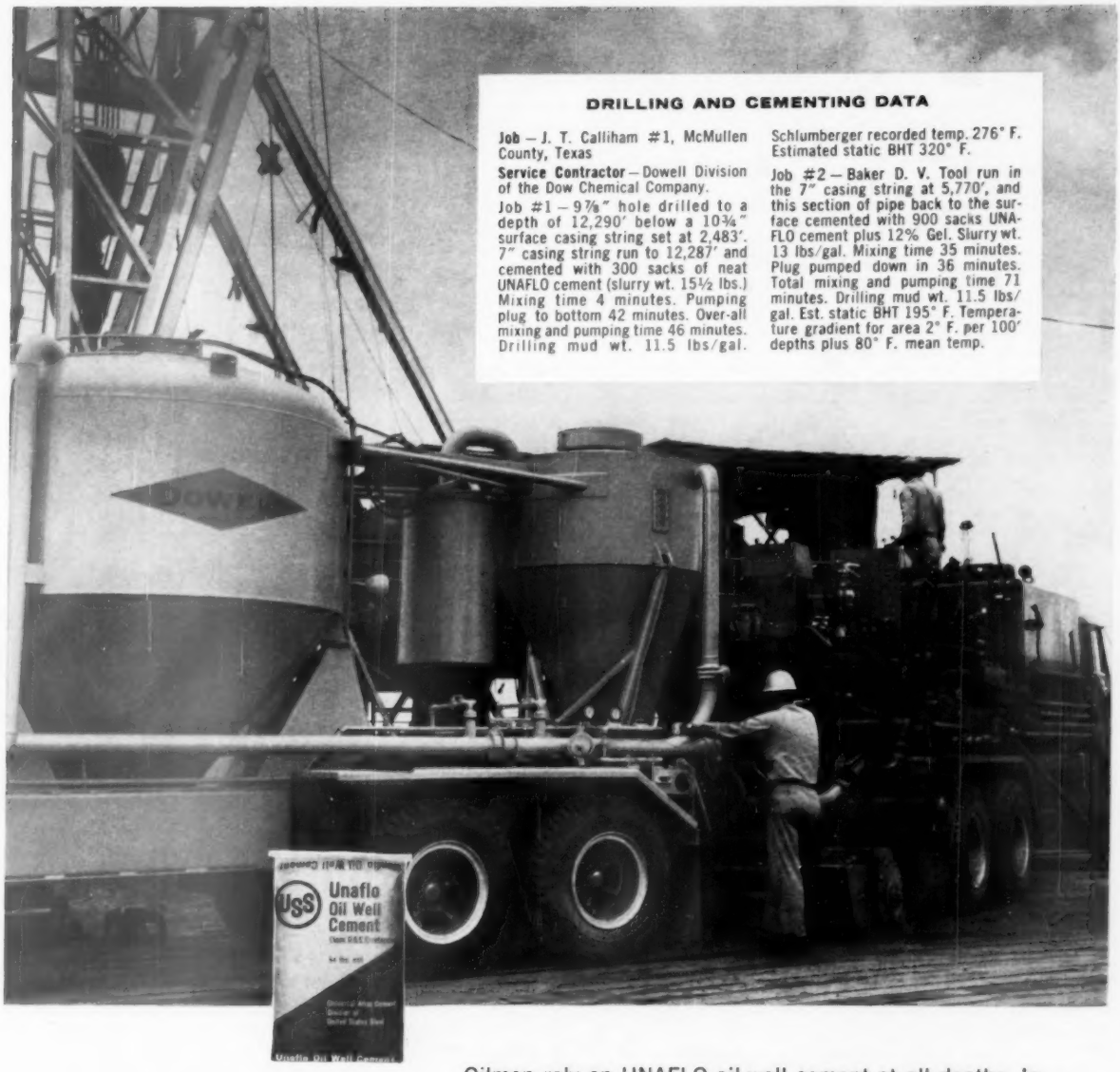
California field offset

The small Prado Dam oil field in Riverside County counted its first offset to the discovery well completed in 1957. The offset, Lido Petroleum Co. 1 Hudson, is 500 ft. northwest of the discovery. The new well was completed in the shallow pay at 3,600-60, 3,690-3,770 and 3,790-3,850 ft. Initially, it was pumping 7½ bbl. an hour of 24°-gravity crude, 3% cut.

Vegas test reports oil, gas shows in Nevada

Trans-World Oil Co. reported oil and gas shows in a wildcat it is drilling 16 miles southeast of Las Vegas in Clark County. The operator was drilling ahead below 1,015 ft.

In northern Nevada's Churchill County, Churchill Drilling Co. was fishing at 5,000 ft. in a 5,300-ft. wildcat it was drilling 3 miles south of Fallon.



DRILLING AND CEMENTING DATA

Job – J. T. Calliham #1, McMullen County, Texas

Service Contractor – Dowell Division of the Dow Chemical Company.

Job #1 – 9⅞" hole drilled to a depth of 12,290' below a 10¾" surface casing string set at 2,483'. 7" casing string run to 12,287' and cemented with 300 sacks of neat UNAFLO cement (slurry wt. 15½ lbs.) Mixing time 4 minutes. Pumping plug to bottom 42 minutes. Over-all mixing and pumping time 46 minutes. Drilling mud wt. 11.5 lbs/gal. Schlumberger recorded temp. 276° F. Estimated static BHT 320° F.

Job #2 – Baker D. V. Tool run in the 7" casing string at 5,770', and this section of pipe back to the surface cemented with 900 sacks UNAFLO cement plus 12% Gel. Slurry wt. 13 lbs/gal. Mixing time 35 minutes. Plug pumped down in 36 minutes. Total mixing and pumping time 71 minutes. Drilling mud wt. 11.5 lbs/gal. Est. static BHT 195° F. Temperature gradient for area 2° F. per 100' depths plus 80° F. mean temp.

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Oilmen rely on UNAFLO oil-well cement at all depths. In shallow depths, it gives good results, used neat or plus additives to lighten slurry weight when high fillups are desired.

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For cementing or recementing, for plug-backs or squeezes, at varying depths, pressures, drilling conditions, UNAFLO cement provides the workable slurry – one that pumps easily, sets hard. For more data, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

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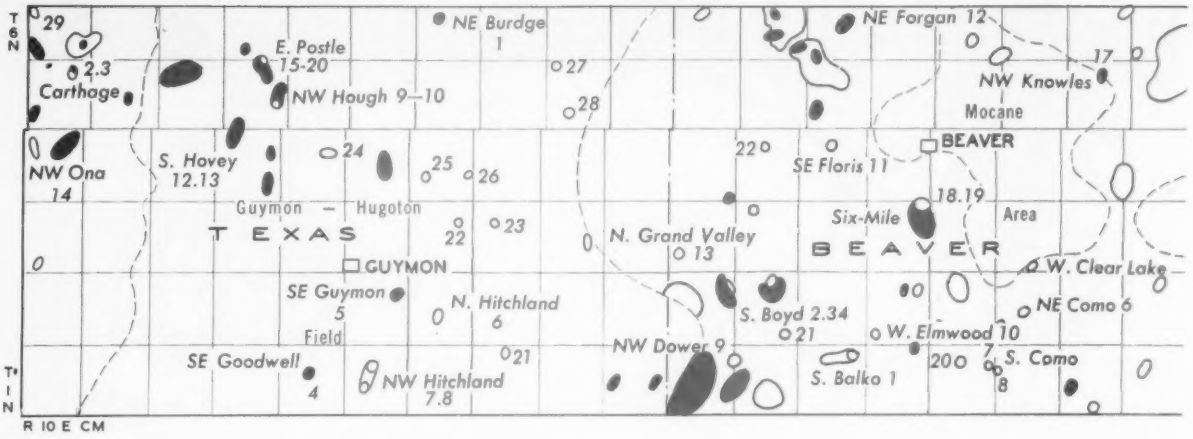


Northwestern Oklahoma Success Ratios

. . . over-all wildcat success: 54.3%

. . . over-all field-well success: 78.4%

. . . Texas County wildcat success: 52.3%; field-well success: 70.4%; 17 active locations

. . . Beaver County wildcat success: 69.8%; field-well success: 76.9%; 54 active locations

. . . Harper County wildcat success: 34.8%; field-well success: 88%; 25 active locations

. . . Ellis County wildcat success: 40%; field-well success: 85.7%; one active location

Texas County jumps into Hugoton lead

THE FASTEST-moving and most successful exploratory and development campaign in the country is now centered in northwestern Oklahoma's Ellis, Harper, Beaver, and Texas counties.

Operators are busy working on 98 active locations throughout this vast four-county area. Objective of the program is the thick and prolific section lying on the southern edge of the shelf of the northwestern Anadarko basin.

Big year. 1959 was the biggest exploratory and develoment year to date in this portion of Panhandle-Hugoton. More wells and more new fields were opened than in any other previous year. Only a few of townships in these counties lack producing areas as a result of the tremendous surge of drilling in the past few years.

● Texas County led the area in discoveries with 29 new fields, new-pay discoveries, and long extension strikes. Most of the driller's impact here was inside the confines of old and shallow Hugoton Permian gas field. The deep Pennsylvanian rocks inside this big field paid off with the largest share of Texas County discoveries. This trend isn't new to the county, but 1959 was the big year here. Of the 29 new strikes, 25 were in Pennsylvanian rocks. A Mississippian discovery at Northeast Burdge gave the county and the Panhandle portion of Hugoton field its first oil from that zone.

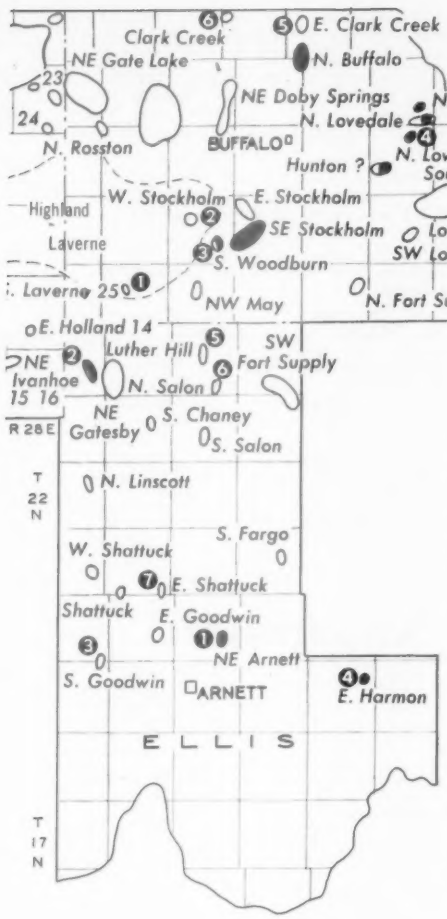
● Beaver County, usually the leader in Panhandle discoveries, came in second with 2 dozen new fields, new pays, and important long extensions. There was no set pattern in Beaver drilling last year—discoveries were in nearly all sections of the county. Development drilling continued high in the Highland-Mocane-Laverne area where a successful link-up program between Harper and Beaver County producing areas is underway. There was a noticeable push to the southern part of the county near the Texas Panhandle line where seven new fields were opened north of Ochiltree and Lipscomb counties, Texas.

● Harper County recorded six new discoveries last year and seven new-pay and extension strikes. This county is fast becoming one of the most important new producing areas in the state, as well as the entire northwestern Anadarko region. Highpoints in last year's oil finding included the buildup of North Buffalo field as one of the basin's most important multipay finds in many years. Seven zones, from Arbuckle Cambro-Ordovician to Pennsylvanian, produce in this field. Three discoveries added to this field last year were first Viola Ordovician oil for the area at Sinclair Oil & Gas Co. 1 Shupe, a tripay find at 1 Kuhn with oil from Lansing, Kansas City, and Oswego limes, and a long Lansing and Arbuckle extension find at An Son 1 Miller.

● Ellis County came up with seven new fields, one of them the first oil producer for the county. All of the finds were in Pennsylvanian rocks.

Discovery well data from National Petroleum Bibliography.

Success ratios from The Oil and Gas Journal files.



THE INFORMATION below and on the next page, a discovery tally of northwestern Oklahoma, is keyed by numbers to the accompanying map.

Ellis County

1. Northeast Arnett Tonkawa oil field: Pan American Petroleum Co. 1 Bayless Operating Unit, C NW SE 23-20n-24w. One oil well at 7,240-7,355 ft. Cameron Crude Co. is outlet.

2. North Catesby lower Morrow oil field: Skelly 1 Alexander, C SW NE 25-24n-26w. Lower Morrow pay at 8,150 ft. Mohawk, Mopetco, Inc. outlet. First oil producer for county. Extended 1½ miles southeast in 1959 by Skelly 1 Bell. Two oil wells.

3. South Goodwin Lower Morrow gas field: Magnolia 1 Meier, C SE NW 36-20n-26w. Lower Morrow 11,000 ft. One gas well.

4. East Harmon Cottage Grove oil field: Odessa 1 Potter Unit, C SE NW 12-19n-22w. Two oil wells. Cottage Grove lime Penn. 7,990 ft. Champlin Refining Co. outlet.

5. Luther Hill Tonkawa gas field: Pan American 1 Phillips Gas Unit, C SW NE 15-24n-24w. Tonkawa pay 5,835 ft. One gas well. Discovery well dualled as discovery for Luther Hill Morrow gas field. Morrow gas at 7,653-56 ft.

6. North Salon Morrow gas field. Pan American 1 Herndon, C SE NW 35-24n-24w. Morrow gas at 8,000 ft. One gas well.

7. East Shattuck Morrow gas field: Pan American 1 Sherrill Operating Unit, C NW SE 36-21s-25w. Morrow well at 9,860 ft. One gas well.

Harper County

1. South Laverne: Cabot Carbon Co. 1 Cornell State, C SW NE 16-25n-25w. Morrow oil field. Morrow 7,360 ft. Three producers.

2. West Stockholm Tonkawa oil field: Sinclair 1 Guthridge Unit, C SE NW 16-26n-24w. Tonkawa 5,560 ft., Champlin Refining Co. outlet. One oil well. Discovery well dualled in Morrow gas pay.

3. South Woodburn Hoover oil field: Pure 1 Crawford-B, C SE NW 26-26n-24w. Hoover 4,329-65 ft. Tonkawa 5,578-5,600 ft. One dual oil and gas well.

4. North Lovedale South: Hamilton Bros. 1-11 Howard, C SW NE 11-27n-21w. Oswego Penn. oil well 5,572-82 ft.

5. East Clark Creek field Morrow gas: Sinclair 1 Rohrer, C SE SW 20-29n-22w. Morrow gas 5,700 ft. One gas well; Elgin 4,366 ft. Two wells, one Morrow, one Elgin.

6. Clark Creek field Morrow gas: Summit Drilling Co. 1 Bates, C NW NE 18-29n-23w. Morrow gas 5,798-5,806 ft. Discovery well on Kansas side is Pure 1-D Tuttle. Two Morrow gas wells on that side of line.

Beaver County

1. South Balko Upper Morrow gas field: Texaco Inc. 1 Naylor, C SE NW 11-1n-22eCM. Upper Morrow 7,390 ft. One gas well.

2. South Boyd Upper Morrow oil field: Sun Oil Co. 1 Sargent, SE NW 13-2n-20eCM. Upper Morrow 6,950 ft. Mohawk-Mopetco outlet, Four oil wells.

3. South Boyd lower Morrow gas field: Union 1 Sargent, NW NW SE 11-2n-20eCM. Pay at 7,050 ft. Four gas wells.

4. South Boyd Mississippian gas: Sun 1 Penner, NW SE 12-2n-20eCM. Miss. 7,350 ft. One gas well.

5. West Clearlake Morrow oil field: Sinclair 1 Eyer, C SE NW 34-3n-25eCM. Morrow 7,740 ft. Two oil wells. Discovery was dualled in Tonkawa gas pay.

6. Northeast Como Middle Morrow gas field: Rip C. Underwood et al. 1 Baggerly, C SE NW 21-2n-25eCM. Morrow 7,575 ft. Two gas wells. Mocane field has developed southward in this area and should combine with this field.

7. South Como Upper Tonkawa gas field: Vickers Petroleum Co. 1 Howard, NW SE 13-1n-24eCM. Upper Tonkawa 5,550 ft. Thickness pay 29 ft. One gas well. Production in discovery commingled with lower Tonkawa pay.

8. South Como Lower Tonkawa gas field: Vickers 1 Mahaffey, NW SE 18-1n-25eCM. Lower Tonkawa 5,950 ft., Seven gas wells. Discovery well was also completed as Morrow and Chester producer.

9. Northwest Dower Chester gas field: Sunray et al 1 Wood Unit, C NW SE 12-1n-20eCM. Chester pay 7,830 ft. Northern Natural Gas Co. outlet. Two gas wells. Discovery dualled in Dower, Northwest (Basal Morrow) gas field.

10. West Elmwood Morrow gas field: Oklahoma Natural 1 Custer, C SW NE 31-2n-23eCM. Morrow pay 7,410 ft. One gas well.

11. Southeast Floris Morrow gas field: Katex Oil Co. 1 Blakemore, C NW NW 10-4n-22eCM. Morrow pay 6,325 ft. One gas well.

12. Northeast Forgan Marmaton oil field: Panhandle Eastern 1-27 Girk, C SE NW 27-6n-24eCM. Marmaton pay 5,490 ft. Cameron Crude-Century Trucks outlet. One oil well dualled in Morrow gas pay.

13. North Grand Valley Keyes gas field: Republic Natural Gas Co. 1 Jolliffe Estate, NW SE 30-3n-20eCM. Keyes pay 6,730 ft. One gas well.

14. East Holland Lower Morrow gas field: K&H Operating Co. 1-27 CLR Eades, C NW NW 27-2n-28eCM. Lower Morrow pay 7,990 ft. One gas well.

15. Northeast Ivanhoe Cherokee gas field: El Paso 1 Oklahoma-Jackson, NW NW NW 7-1n-28eCM. Cherokee pay 7,300 ft. One gas well.

16. Northeast Ivanhoe Morrow gas field: Union 1 Dycke, C SE NW 8-1n-28eCM. Morrow 8,210 ft. One gas well.

17. Northwest Knowles Cherokee oil field: Champlin 1 Albert "B," C NE SW 3-5n-26eCM. Cherokee pay 5,800 ft. One oil well. Well dually completed in Council Grove gas pay.

18. Six-Mile Oswego oil field: Cities Service 1 Benjegerdes, SW NW 2-3n-23eCM. Oswego pay 5,920 ft. One oil well. Discovery dualled in Morrow gas pay.

19. Six-Mile South Oswego oil field: Sinclair 1 Overton, C NE SW 13-3n-23eCM. Oswego pay 6,325 ft. One oil well.

20. Unnamed field, Mayflo Oil Co. 1-9 Perry Jenkins, C NW SE 9-1n-24eCM. Gas-condensate production in Morrow L and S-4 sands.

21. Unnamed field, Stekoll Petroleum Corp. 1-26 Lane, SW SW 26-2n-21eCM. Morrow gas production.

22. Unnamed field, Mountain States Petroleum Corp. 1 Blakemore, C NW SE 9-4n-21eCM. Chester gas.

23. Unnamed field, Statex Petroleum Co. 1 Long, C NE SW 9-5n-28eCM. Morrow gas-condensate.

24. Unnamed field, Stekoll 1 Patten, C NW SE 34-5n-28eCM. Mississippian gas.

Texas County

1. Northeast Burdge St. Louis oil field: Republic 1 Curtis, C NW SE 16-6n-16eCM. St. Louis 6,850 ft. Opens first Mississippian oil production in Oklahoma portion of Hugoton field.

2. Carthage Topeka gas field: Graham-Michaelis Drilling Co. 1 Fatzer, SE NW 2-5n-10eCM. Topeka pay 3,020 ft. Panhandle Eastern outlet. Six gas wells. Discovery dually completed in upper Morrow oil pay.

3. Carthage Morrow "G" sand oil field: Graham-Michaelis 1 Chesley, C NE SW 19-6n-11eCM. Morrow pay 4,600 ft. Cameron Crude, Century Trucks, Thompson Crude outlet. Two oil wells. Discovery dualled with Topeka gas pay.

4. Southeast Goodwell Cherokee oil field: Phillips 2 Muss, C NE SW 16-1n-14eCM. Cherokee 6,025 ft. Cameron Crude outlet. One oil well.

5. Southeast Guymon Oswego oil field: Skelly Oil Co. 1 Montgomery A, SE NW

11-2n-15eCM. Oswego pay 5,800 ft. One oil well.

6. North Hitchland Oswego gas field: Phillips 1 Hitch T, NE SW 21-2n-16eCM. Oswego pay 5,830 ft.

7. Northwest Hitchland Council Grove gas field: Phillips 2 Reust, C SE NW 20-1n-15eCM. Council Grove 3,150 ft. This well is 35 miles southwest of nearest Council Grover Permian production in Beaver County and 25 miles southeast of nearest Council Grove production at Hovey South field in Texas County.

8. Northwest Hitchland Morrow "G" gas field: Phillips 2 Atar, C NW SE 9-1n-15eCM. G sand pay 6,850 ft.

9. Northwest Hough Morrow "A" oil field: Republic 3 Welch, C NW SE 13-5n-13eCM. Morrow "A" sand pay 6,170 ft. Thompson Crude outlet. Five oil wells. Discovery well dualled in Northwest Hough Morrow G field.

10. Northwest Hough Morrow "G" oil field: Republic 2 Welch, C SE SE 13-5n-13eCM. Morrow pay 6,540 ft. Thompson Crude outlet. Three oil wells.

11. Northwest Hough Keyes gas field: Republic 1-M Horner, NW NE 24-5n-13eCM. Keyes sand 6,570 ft. One gas well.

12. South Hovey Cherokee oil field: Republic 12 Cities Service, C NW SW 5-4n-13eCM. Cherokee pay 5,480 ft. Thompson Crude outlet. Thirteen oil wells.

13. South Hovey Morrow A oil field: Republic 14 Cities Service, C NW SE 32-5n-13eCM. Morrow A pay 6,100 ft. Thompson Crude outlet. One oil well.

14. Northwest Ona Morrow - Purdy gas field: Pico Drilling Co. 1 Brumley, C NW SE 7-4n-10eCM. Purdy 4,445 ft. Colorado Interstate outlet. One gas well.

15. East Postle Cherokee gas field: Republic 3 Julian, NW NW SE 3-5n-13eCM. Cherokee pay 5,650 ft. One gas well.

16. East Postle Morrow "B" gas field: Republic 3 Julian, NW NW SE 3-5n-13eCM. Morrow "B" pay 6,330 ft. One gas well.

17. East Postle Morrow "A" oil field: Republic 5 Julian, C NW SE 3-5n-13eCM. Morrow "A" pay 6,140 ft. One oil well. Indications are that the three multipay Postle fields and Hough, Northwest field will emerge.

18. East Postle Morrow "G" oil field: Republic 4 Julian, C SE NW 3-5n-13eCM. G pay 6,450 ft. Three oil wells.

19. Southeast Postle Morrow "A" oil field: Republic 3 Blake, C SE NW 11-5n-13eCM. Morrow "A" pay 6,120 ft.

20. Southeast Postle Morrow "B" gas field: 4 Blake, C NW SE 11-5n-13eCM. Morrow "B" pay 6,360 ft. One gas well.

21. Unclassified: Peerless and Hamon 1 Wall, SW NE 4-1n-17eCM. Chester gas discovery.

22. Unclassified: Cabot Carbon 4 Calvert, C SW NE 11-3n-16eCM. Morrow gas discovery.

23. Unclassified, Shell Oil Co. 1-8 Balzer, C SW NE 8-3n-17eCM. Morrow gas discovery.

24. Unclassified, Cities Service 1 Stelzer "A," NE SW 11-4n-14eCM. Morrow gas discovery.

25. Unclassified, Shell 1-20 Fisher, C NW SE 20-4n-16eCM. Morrow Keyes gas-condensate discovery.

26. Unclassified, Shell 1-24 Wright, C SW NE 24-4n-16eCM. Keyes gas discovery.

27. Unclassified, Peerless & Hamon 1 Henderson, C NE SW 5-5n-18eCM. Chester gas discovery.

28. Unclassified, Peerless & Hamon 1 Elmore, SW NW SE 28-5n-18eCM. Chester gas discovery.

29. Unclassified, Sierra Petroleum Co. 1 Miller, C SW NE 18-6n-10eCM. Purdy gas discovery.

Big 1959, even better 1960 for Keystoners

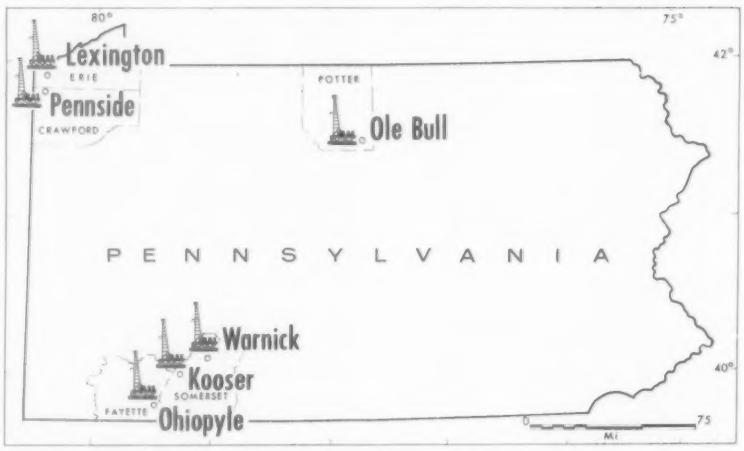
THE DISCOVERY of one new gas field, six new gas pools, and the extension of several gas-producing areas highlighted the oil and gas exploration in Pennsylvania during 1959.

A rank wildcat in Fayette County on the Mueller-Herr farm by Manufacturers Light & Heat Co. discovered a new gas field on the Laurel Hill anticline. The well found gas in the Onondaga chert (Middle Devonian) discovering the Ohiopyle field. After fracturing, the initial open-flow was 4,800 M.c.f.d. at a rock pressure of 3,450 psi., in 162 hours. A second gas well was drilled in this field before the year ended.

In Erie County. One of the new pools (Lexington pool) was discovered in Erie County at 1 Anna Packen, by World Wide Petroleum Co. The initial open-flow amounted to 403 M.c.f.d. after fracturing the Grimsby (Lower Silurian) formation.

Another new pool (Pennside pool), also producing from the Grimsby, was discovered by the Pennsylvania Gas Co. in Crawford County on the Conneaut Valley farms. After fracturing, the initial open flow was 499 M.c.f.d. of gas at a rock pressure of 933 psi in 72 hours.

A third new pool was discovered by Phillips Petroleum Co. when it drilled its No. 1 well on Pennsylvania Tract 81, discovering the Ole Bull pool in Leidy field, Potter County. Production amounted to 983 M.c.f.d. of gas from the Oriskany sandstone (Lower Devonian), at a rock pressure of 4,427 psi. in 24 hours.



HALF A DOZEN GAS DISCOVERIES highlighted 1959 exploration in Pennsylvania. The search for gas continues in 1960 at a fast clip.

In Somerset County. The fourth new pool is Kooser pool in Somerset County discovered by No. 3 well on Pennsylvania Tract 75 by Peoples Natural Gas Co. Production amounted to 10,933 M.c.f.d. of gas from the Onondaga chert without fracturing; the rock pressure was 3,400 psi. in 10 days. This well established a new producing-depth record for Pennsylvania when gas production was found in the Onondaga chert at 8,472 ft.

The 1 R. S. Warnick well by Felmont Oil Corp. and Peoples Natural Gas Co. discovered the fifth new gas pool in the state and the second for Somerset County during the year. This Warnick pool well produced 189 M.c.f.d. after being fractured with a rock pressure of 2,839 psi. in 7 days.

In Clearfield County. The sixth new pool was in the shallow (Upper Devonian or younger) producing area. The discovery well was the 1 Earl Young, drilled by James Drilling Co. in Clearfield County. The well produced, after fracturing, 2,200 M.c.f.d. from the fifth (Upper Devonian) sand, with a rock pressure of 520 psi. in 72 hours.

Deep drilling. Deep drilling (Middle Devonian or older) accounted for 122 wells during 1959, of which 89 were gas wells and 33 were dry holes. Of the 89 gas wells, 6 were wildcats, and 17 of the 33 dry holes were

wildcats. Eighty-five gas wells were fractured, producing 558,152 M.c.f.d. after fracturing, compared with 115,201 M.c.f.d. before fracturing. The total deep footage amounted to 850,025 ft. Of the deep wells completed during the year, 103 were drilled with rotary tools (most of these air rotary), and 19 with cable tools.

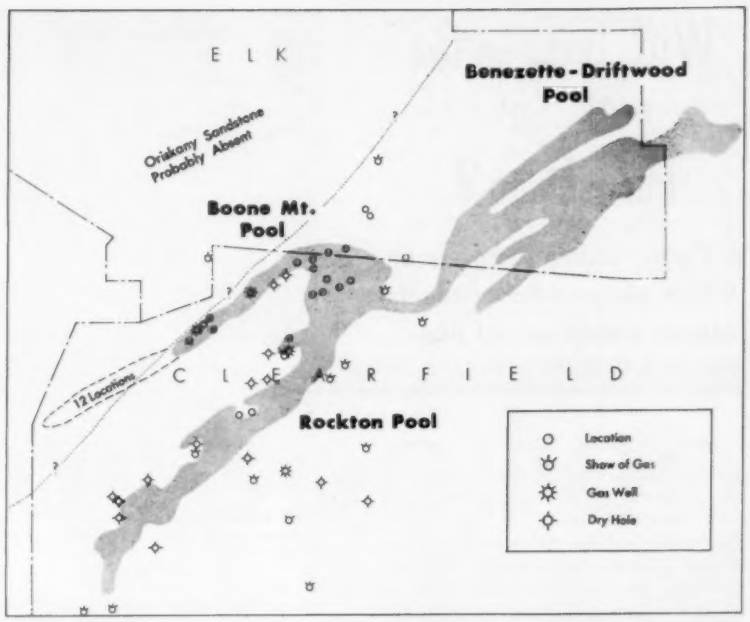
There were 628 shallow-sand (Upper Devonian or younger) wells completed. Of these, 215 were gas wells, 10 were oil wells, 54 were dry holes, and 7 were drilled for underground gas storage. Some 342 were drilled in connection with secondary-recovery operations, of which 213 were oil wells. In addition to the 628 new wells, 29 shallow-sand wells were deepened. The total footage of the new and deepened wells was 1,452,759 ft. The 10 new oil wells had a total initial production of 55.5 bbl. of crude oil per day. The 215 new gas wells had a total initial open-flow capacity of 152,832 M.c.f.d. Of these wells, 176 were fractured. The combined initial open-flow capacities of the 176 gas wells was 147,110 M.c.f.d. after fracturing, as compared with 34,572 M.c.f.d. before fracturing.

The total number of wells drilled during the year both shallow and deep is 750. Twenty-four of these were exploratory tests, of which 7 were gas and 17 were dry, giving a success ratio of 1 in 2.4. Of the 401 completions drilled outside of underground gas storage or secondary-recovery operations, 87 were dry, or a dry hole ratio of 1 in slightly over 4.1. The total footage drilled, both shallow and deep, was 2,302,784 ft.

Production. Oil production decreased from 6,471,680 bbl. in 1958 to 6,160,387 bbl. in 1959. Proved oil reserves were estimated at 113,858,000 bbl. as of December 31, 1959. Gas production increased from 104,974 M.M.c.f. in 1958 to an estimated 118,862 M.M.c.f. in 1959. Gas reserves were estimated at 1,051,972 M.M.c.f. at the end of the year. Over 60,000 bbl. of distillate were produced in 1959. The total reservoir capacity for storage of natural gas in Pennsylvania is 455,885,473 M.c.f.

The primary targets for gas production in the shallow-sand fields continued to be the Speechley, Balltown, and Bradford Third sands. The greatest activity in the shallow-sand gas belt of western Pennsylvania was in Armstrong County where 85 new gas wells were drilled.

Rockton. Rockton pool in Clearfield County had the most completions during the year with 39 gas wells and 4 dry holes. Two large gas wells were completed in this pool. The 11 Helen D. S. Gordon had a natural initial gas production of 70 M.M.c.f.d. and the 1 Green Glen was completed with an initial production of 45 M.M.c.f.d.



ROCKTON POOL had the most well completions in 1959, followed by Boone Mountain. There are 12 active locations at the southwest extension to the latter field.

Boone Mountain. The pool with the second-largest number of completions was the Boone Mountain pool with 25 gas producers and 5 dry holes. The productive limits of these two pools in the Clearfield County area were joined when production was found on a divide in the Caledonia syncline. The syncline had separated the Boone Mountain pool production on the east flank of the Sabinsville anticline from that of the Rockton pool to the east on the west flank of the Chestnut Ridge anticline. Development drilling also merged Rockton pool production to that of Benezette-Driftwood pool to the north. These three pools plus Reed-Deemer pool are now referred to as Punxsutawney-Driftwood field, extending for about 50 miles in a northeast-southwest direction. Benezette - Driftwood pool produces from the Oriskany formation while the three pools to the south produce from the Onondaga-Oriskany interval.

Companies. By the end of the year six major oil companies had established offices in Pittsburgh. Extensive seismic, geological, and leasing activity has been started by these companies and other companies who have offices in the surrounding states. Over 2,000,000 acres were leased in Pennsylvania during 1959 for oil and gas exploration. Two major oil companies drilled their first wells in the state during the year.

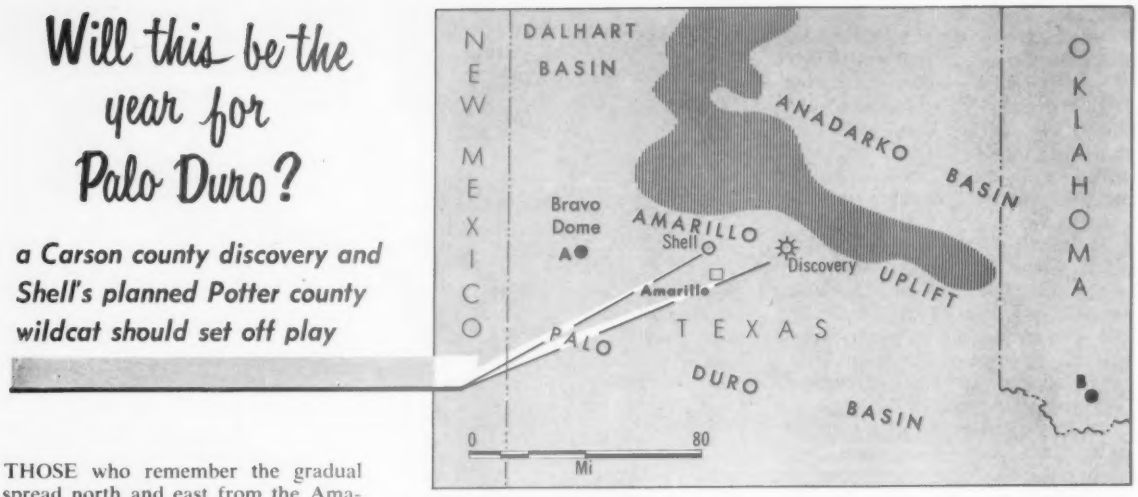
At the year's end attention was focused on a Gatesburg (Upper Cambrian) sandstone test in Erie County, which found gas instead of salt water (which 13 previous Gatesburg tests found). Other interesting prospects: a possible gas well in Warren County from the Medina (Lower Silurian) section, a Greene County well on the Waynesburg dome, and a Northumberland County wildcat. As soon as weather permits, a second well will probably be drilled in 1960 on Pennsylvania's Offshore Block No. 1.

Development drilling during 1960 will be centered in Punxsutawney-Driftwood field where operators will be in search of the southwestern limit of Boone Mountain pool along the present trend on the east flank of the Sabinsville anticline.

Seismic work. Seismic activity more than doubled since 1958. Operators have kept four seismic crews busy throughout the southwestern and northeastern parts of the state. More geological field parties have been active in 1959 than in the previous year. An airborne magnetometer survey of the Appalachian basin area is being flown and is scheduled for completion in November 1960.

Will this be the year for Palo Duro?

a Carson county discovery and Shell's planned Potter county wildcat should set off play



THE BASIN on the north side of the Amarillo uplift has long evaded the oil hunter. Palo Duro's day may come with 1960 exploration.

THOSE who remember the gradual spread north and east from the Amarillo Mountain uplift in the Texas Panhandle and its corresponding Panhandle oil and gas field and Hugoton gas field, are looking with interest at current developments on the south and western side of the same geological feature.

Dividing two of the largest basins in the Continental United States, the Anadarko and the Palo Duro basin, the Amarillo Mountain uplift has long ranked as one of the major petroleum-producing provinces of the continent.

Ten years ago. Slightly over a decade ago, exploration began a slow descent off the northeastern flank of the uplift onto the shoulders of the Hugoton embayment and gradually into the Anadarko basin itself. The five-state Amarillo - Hugoton area is now the fastest - growing producing area in the U. S.

Palo Duro's beginning. Just as the spread into the Anadarko basin started with a deep discovery some 30 miles northeast of the existing Panhandle field in 1949, the spread southwest into the Palo Duro basin started with a deep discovery in 1957.

Many dry holes were drilled in the Anadarko basin with only scattered success until some 3 years later, 1952, when the prolific Quinduno field was opened. Three years have also expired since the first discovery in the Palo Duro basin. A total of three small oil pools are producing in the western part of the basin (A on map). In Oklahoma (B on map) there is some oil at the east end of Palo Duro.

Carson discovery. Texas Gulf Producing Co. of Midland has completed a prolific Brown dolomite gas discovery with helium content reported at 2%. B.t.u. is also known to be somewhat lower than that in Panhandle gas field, 7 miles north.

BY KENNETH CHASTEEN
Managing Editor,
Dwight's Panhandle Oil Explorer,
Amarillo, Tex.

The firm's discovery, 1 Bobbitt, is located 660 ft. from the west line and 1,980 ft. from the north line of Section 95, Block 2 of the TTRR Survey in west-central Carson County.

The well was bottomed at 4,765 ft., logged and cased to 3,463 ft. for completion. The lower Albany Brown dolomite section was opened with four shots per foot at 3,386-3,400 ft. and 3,338-78 ft. to receive 10,000 gal. of 5% acid and 20,000 lb. sand in a fracture treatment. Operators then opened additional stratas of the same pay at 3,306-20 ft., 3,286-98 ft., 3,264-74 ft. and 3,247-52 ft. with the same method. Fracture treatment here was 20,000 gal. of 5% and 40,000 lb. sand. The entire zone was swabbed to kick off and flowed to clean immediately. A separator was set and a flow gage of 2,500 M.c.f.d. was taken through casing. Operators have since completed the well for a calculated open-flow potential of 9,500 M.c.f.d. Elevation is 3,501 ft. and log top of the Brown dolomite is 3,239 ft.

The new discovery is in the approximate center of a 5,120-acre block; however, several other companies are well represented in the area. Included are such firms as Continental, Mobil Oil, Consolidated Gas & Equipment, and the Shamrock Oil & Gas Corp.

Shell to drill. Further interest in the Palo Duro has been added with the announcement by Shell Oil Co. for a new basement test to be drilled 8 miles south of Panhandle gas field in Potter County. Many people will watch this well with interest not only in the deeper zones, but in the hope it will prove the Red Cave, a blanket sand, productive outside of the existing Permian producing area.

Location is 1-207 Bivins Ranch in Section 207, Block 2 of the AB&M Survey. Drill site is 12 miles north of Amarillo and 7 miles northeast of Bush Dome helium field which is now being used by the Bureau of Mines as a storage facility.

If history holds its course of repeating itself, this should be the year for the Palo Duro.

Few fields produce most Rockies' oil

LAST YEAR'S Rocky Mountain production figures show that 86.1% of the region's output came from a little less than 12% of the fields in that area.

According to "Petroleum Information" in Denver, figures show that 123 of about 1,040 fields averaged about 706,700 bbl. daily. Total regional output was 806,000 bbl. per day. Petroleum Information states that the 123 fields fall into the group of fields making 1,000 bbl. daily or more. Selection of the figure of 1,000 bbl. per day is arbitrary. If larger fields are analyzed and a figure of 10,000 bbl. daily is used, 20 fields are found in this class. They account for 1.9% of the region's total producing fields, but they had 46.7% of regional production on a daily average basis at the close of 1959.

The fields producing 1,000 bbl.

daily or more contributed a substantial percentage of the total production of each state for the most part.

State	No. of fields averaging 1,000 bbl. daily or more	% of state's total daily average production
Colorado	23	80.8%
Wyoming	52	90.0%
Nebraska	10	35.4%
Utah	9	98.0%
Northwest New Mexico	3	88.2%
Montana	15	85.7%
North Dakota	11	82.0%
Total	123	86.1%

Leading 20 fields in the Rockies in terms of daily average production at the end of 1959 are:

Adena, Colorado, 20,140 bbl.; Rangely, Colorado, 46,938 bbl.; Aneth, Utah, 27,290 bbl.; McElmo Creek, Utah, 27,469 bbl.; Ratherford, Utah, 23,556 bbl.; White Mesa, Utah, 16,762 bbl.; Bisti, New Mexico, 13,674 bbl.; Horseshoe, New Mexico, 12,274 bbl.; Elk basin, Wyoming, 51,563 bbl.; Elk basin, Montana, 9,452 bbl.; Garland, Wyoming, 16,639 bbl.; Grass Creek, Wyoming, 11,000 bbl.; Hamilton dome, Wyoming, 23,657 bbl.; Lost Soldier, Wyoming, 10,024 bbl.; Oregon basin, Wyoming, 12,677 bbl.; Salt Creek, Wyoming, 15,589 bbl.; Cabin Creek, Montana, 11,215 bbl.; Pine, Montana, 13,624 bbl.; East Poplar, Montana, 10,015 bbl., and Beaver Lodge, North Dakota, 10,223 bbl. Total was 383,681 bbl.

Petroleum Information points out that more of these fields are located in Wyoming than in any other state, and mostly in Big Horn basin. Only a few of the newer fields in the Rockies are on the list.

In Colorado, only three western fields made 1,000 bbl. per day or more. They are Rangely, Wilson Creek, and McCallum. Some new fields are listed on the eastern Colorado side. They are Adena, Little, and Big Beaver. In Nebraska, 10 fields make 1,000 bbl. or better daily. But they account for only 35.4% of the state's daily output. A new field, Singleton, was in second place last year with 5,086 bbl. daily. Sloss leads with 5,174 bbl. daily. Willson Ranch made 3,125 bbl. daily. In Utah, the daily average last year was 113,193 bbl. daily, third place in the Rockies. The lion's share of Utah's output is in the Aneth area.

Only 1,000-bbl. fields outside the Paradox basin are Red Wash, Walker Hollow, and Ashley Valley. In Northwest New Mexico, output is 35,559 bbl. per day with Bisti, Horseshoe Canyon, and Verde getting 31,384 bbl. per day of it. Wyoming put out 391,000 bbl. per day. 52 of the 250 fields in Wyoming are within the 1,000-bbl. group. These 52 fields provide 90% of the state's total output. More than half of them are in Powder River, but the fields with the largest daily output are in Big Horn basin. Montana has 94 producing fields, 15 making 1,000 bbl. per day or better. These 15 make up 72,300 bbl. of the over-all average of the state which is 84,300 bbl. daily. Nine of the fifteen are in Williston basin. North Dakota has 75 fields, 11 of them making 1,000 bbl. per day or better. (Data from Petroleum Information.)

North Tejon extended in California

Deep production in the North Tejon field of Kern County was successfully extended ¼ mile east of the nearest producer by a Standard Oil Co. of California test in SW SW 16-11n-19w. The operator was installing a christmas tree and displacing the mud with oil in preparation for completion. On a Johnson formation test of the interval 11,805-12,260 ft., with a 2,798-ft. mud cushion, the well recovered 7,812 ft. of net clean oil with the tester open 3 hours, ¼-in. choke.

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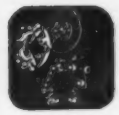

Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

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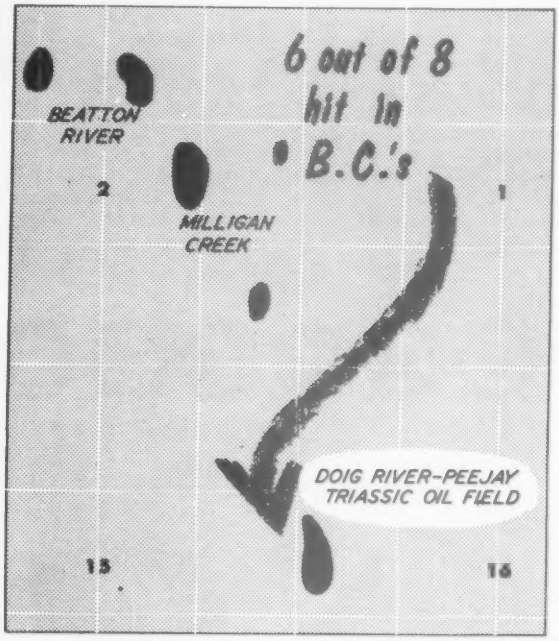
CLUTCHES

Heavy B.C. drilling program taps Triassic



ONE OF British Columbia's newest oil fields, Doig River-Peejay, enjoys a 75% success ratio. The field was opened just last year, and has had six strikes in eight tries.

A PROMISING new oil field for northeastern British Columbia is Doig River-Peejay, 50 miles northeast of Fort St. John and 35 miles northwest of Boundary Lake oil field. The field is a new link in the chain of fields building up along the Beatton River-Boundary Lake Triassic trend.

Sinclair Canada Oil Co. opened the field last year at D-39-E Peejay for 153 bbl. of oil on a 7½-hour test. This past winter's drilling campaign, heaviest in B. C. history, uncovered six oil wells out of eight drilled. A direct west offset and a northwest diagonal offset to the field discovery well were abandoned.

Tight holes. All of Sinclair's wells were tight holes until last week. The six wells that are new producers for this Triassic area are: Sinclair et al. D-18-E Peejay, D-28-E Peejay, D-29-E Peejay, D-38-E Peejay, D-40-E Peejay, D-48-E Peejay, D-49-E Peejay, and D-50-E Peejay. All wells are Schooler Creek Triassic oil successes.

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THE PRESIDENT
Seaway Gas & Oil Ltd.,
Suite 201—620 St. James St. W.,
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Canada.

Well fractured in Ohio's Fallsburg

Ohio's Fallsburg pool came back to life on March 16 when Hoosier Oil Co.'s 1 Melvin Ashcraft was fractured.

This Clinton sand producer located in Section 12, Fallsburg Township, Licking County, topped the Clinton sand at 3,088 ft. and encountered a solid pay section with no break of 52 ft. of sand. The well quickly filled up natural and 40 bbl. was swabbed from the formation while awaiting fracture preparations. As soon as the 800 bbl. of fracturing oil was recovered by flowing, the well flowed 400 bbl. the first 18 hours and was shut in for lack of tankage.

Hoosier Drilling Co. has also just completed the 1 Floyd Lowe in Clark Township, Coshocton County, Ohio, to a total depth of 3,816 ft. Clinton sand section from 3,747-94 ft. proved high saturation and is now being fractured.

Hoosier just drilled in its 2 Ray D. Barcus in Harrison Township, Knox County, with a total depth of 2,786 ft. The Clinton sand had a 26-ft. pay section and is now being fractured.

E. L. Newton, President of the Hoosier companies announced a stepped-up drilling program in Ohio as a result of recent successful operations.

New Clinton pool for Ohio's Perry

IN OHIO, Taft McGee reports indications of a new Clinton sand pool opener in southwest Pleasant Township, Perry County.

The 1 Andrew Sarvis, Section 1, was shut-in with a natural gage of 1,210 M.c.f.d. and rock pressure of 1,200 psi. The sand was found from 3,614-48 ft.

Two offsets to the Cambro-Ordovician oil find, Monk Oil & Gas Co. 2 J. N. Monk, Section 22, Bennington Township, Morrow County (OGJ, Jan. 11, 1960) are reported as being abandoned.

Several acid treatments of shows at 3,578-84 ft., 3,601-07 ft. and 3,614-20 ft. failed to indicate an appreciable increase of oil in Monk Oil & Gas Co. 1 P. & B. Boyd, Lot 16, 1 Q., Porter Township, Delaware County. Abandonment depth was 3,739 ft.

D. O. Lynn 1 Grace Myser, Section 21, Bennington Township, Morrow County, indicated a showing of oil from 3,702-11 ft. After running the Hydrosonic tool, the well made 1 gal. of heavy black oil. Drilling was continued at 3,725 ft. but had a hole full of water at 3,851 ft. and is being plugged.

Another gas well for Fort Nelson area

IN BRITISH COLUMBIA, Western Natural Gas Co., Inc., formerly known as Gulf States Oil Co. of Canada, and a wholly owned subsidiary of Western Natural Gas Co., announces the completion of its 3 Fort Nelson gas well.

This well is approximately 5½ miles southeast of the Fort Nelson, British Columbia, and midway of a 9-mile spread between 5-X Clarke Lake to the northeast, and 1 Prophet River to the southeast.

Absolute open-flow potential of this well has been calculated at 135 M.M.c.f.d. pipe. Flow comes from 364 ft. of continuous porous dolomite above the water line in the Middle Devonian formation.

The 2 Petitot River gas well was completed in the Middle Devonian formation with an absolute open-flow potential of 185 M.M.c.f.d.

This well is 1¾ miles southeast of Western's 1 Petitot River, field-discovery well of last winter. Petitot field is approximately 70 miles north-northeast of Fort Nelson.

The 6 Clarke Lake gas well was completed.

This is a field extension well 1¾ miles east of 2 Clarke Lake. Clark Lake field is approximately 10 miles east of Fort Nelson.

Completion was in the Middle Devonian formation, with a flow rate of 8,260 M.c.f.d. on a ½-in. choke at 1,475 psi. flowing pressure.

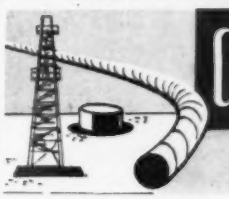
The 4 Kotcho Lake gas well was completed in the Middle Devonian formation with a flow rate of 9,600 M.c.f. through a ½-in. choke at 1,600 psi. tubing pressure.

This well is 4 miles southeast of Western's 3 Kotcho Lake which was the Middle Devonian field-discovery well drilled and completed in February 1959, approximately 50 miles northeast of Fort Nelson. The recent Pacific Kotcho Lake gas well lies 4½ miles northeast of the 3 Kotcho Lake. These wells indicate that the Kotcho Lake area has gas reserves of significant proportions.

Illinois drilling steps up pace

WITH THE advent of better drilling weather, Illinois basin activity shows a definite stepup.

In Clay County, Illinois, Black and Black Oil Co. 1 W. E. Brooks in NE SE SE 29-5n-7e, 2 miles south of Bible



Practical ideas for BETTER Cathodic Protection

ARE YOU GETTING THE MOST FOR YOUR MAGNESIUM ANODE DOLLAR?

Many corrosion engineers are concerned over the composition specifications of magnesium anodes used to stop corrosion on pipe lines, oil well casing, etc.—and rightly so. But there is a more important factor that is sometimes overlooked. This is the *actual weight* of the bare anode, particularly in backfill-packaged units.

During the past several years an increasing number of the companies that use anodes have found it pays to spot check the metal weight of all anodes purchased. Often the small cost of pulling the anode from the packaged backfill has been worthwhile. 17-pound anodes have been found to weigh as little as 14 pounds, 32-pound anodes from 26 to 30 pounds, and 50-pound anodes only 44 pounds.

We at CSI feel that, regardless of the supplier, a spot check should be made of all anodes purchased. Of equal importance, requests for quotations and the subsequent purchase orders should *define all specifications*. As far back as 1945, the industry set maximum weight deviations for bare magnesium anodes at ±3 per cent of the designated weight. We suggest that, if this condition is specified and checked, you will be getting more for your magnesium anode dollar.

You'll find it to your advantage to check with CSI for engineering and installation services, and for quality supplies for both anode and rectifier installations. Estimates or competitive quotations without obligation. Let our stock-holder-employees demonstrate the economical and satisfactory service they can give you. Call or write today.

CSI

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Tel. CHerry 1-7795

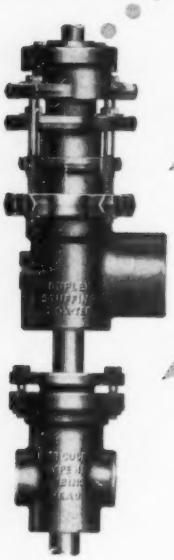
General Office: Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
Tel. Circle 5-1351

slim hole EQUIPMENT

FIRST from HERCULES

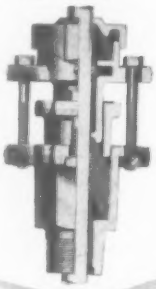
HERCULES is First to provide a complete line of equipment for this new Oil Production Technique.

The use of 2½" tubing for casing and 1¼" or 1½" tubing as the oil string has made it necessary to develop new equipment specifically for this purpose. In response to the requests of production men, Hercules now provides tested and proven production equipment for Slim Hole Drilling. The well-known Hercules "Tee-Type" Duplex Stuffing Box and the new 2½" Hercules Type "HF" Tubing Head are incorporated in this typical Slim Hole well hook-up. Hercules "Tee-Type" Duplex Stuffing Box is now available in 1¼" and 1½" tubing sizes (plain or EUE) with the same packing and parts used in all Hercules Duplex Stuffing Boxes.



HERCULES "TEE TYPE" DUPLEX STUFFING BOX A combination Tee and Stuffing Box with female thread to screw directly onto the 1¼" or 1½" tubing, eliminating one-threaded connection and resulting in a considerably shorter hook-up. 3000 PSI test. Approximate height 15". Weight 33#. Price $31.00.

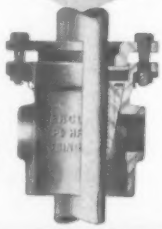
HERCULES TYPE "HF" SLIM HOLE TUBING HEAD Features the safety and quality that you receive in all Hercules tubing heads at a minimum price. Pressure cast, one piece steel body with 2" side outlets and heat-treated hinged slips. Over-head packed with neoprene packing. 1000 PSI test. Height 8½". Weight 19#. Price $49.50.



HERCULES "REGULAR TYPE" DUPLEX STUFFING BOX Proven design and dependability render this stuffing box unequalled for the difficult pumping situations as well as easy ones. Constructed from malleable iron, it protects workers from the danger of shattered metals should rods accidentally drop. The new 1¼" or 1½" "Regular Type" Stuffing Box is ideal for use in Slim Hole installations.

HERCULES TYPE "DS" PUMPING TEES In the 1¼" and 1½" sizes these Tees are ideal for use on Slim Hole well hook-ups.

HERCULES TYPE "HF" TUBING HEAD In spite of its economical price, the Type "HF" Tubing Head is pressure cast with one piece cast body and Overhead Packed with neoprene Packing Ring. This Head is now available for 2" or 2½" Tubing to suspend ¾" to 1½" Inner String (Plain or EUE) for Slim Hole operations.



All Hercules Products for Slim Hole Drilling may be purchased through the supply store of your choice. Write for complete information.

HERCULES TOOL COMPANY

Manufacturers of Oil Field Equipment

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Export Representative Oil Field Equipment Co., Inc. 90 West Street, New York, N. Y.

Grove, recovered 1,070 ft. of gas, 340 ft. of clean oil on a drill-stem test in the Aux Vases at 2,758-96 ft.

In Sangamon County, Illinois, 1 mile southwest of Rochester and 4 miles southeast of Springfield, the second good well was completed by R. H. Troop. The 1 F. L. Clark in NE SW SW 21-15n-4w, made 200 bbl. per day on pump from Silurian at 1,604-09 ft. The discovery well was Aladdin Oil Co. 1 T. E. Scott in SE NW SW 21-15n-4w. That January discovery flowed 600 bbl. daily from Silurian reef at 1,590-1,605 ft.

In Indiana's Spencer County, Otis W. Greer 1 Sam and Albert Varner, NW SE NW 31-6s-4w, made 126 bbl. of oil the first day on the pump. Location is 4 miles east of Grandview.

Northwestern Oklahoma activity continues brisk

Three counties in northwestern Oklahoma figured highly in exploratory news. Pan American Petroleum Corp. is opening a Chester Mississippian gas pool at 1 Houk in C NE SW 8-21n-15w, Major County, south of Southeast Del Plains pool.

Tests of the Chester got 5 M.M.c.f.d. following acid treatment. Perforations were not reported. Log top of the Chester was 7,474 ft. Pan American opened the pool to the north with both Cherokee Pennsylvanian and Chester production.

West Chester. This Woodward County field got its third well at Ashland Oil & Refining Co. 1-A Wyckoff in C SE NW 3-20n-17w.

This third Chester lime producer for West Chester pool flowed 7,000 M.c.f.d. on 22/64-in. choke. Perforations were at 8,016-32 ft.

Goodwin field. This Ellis County field got its second producer at Mobil Oil Co. 1 Ruf in C SE NW 35-20n-26w. The Morrow Pennsylvanian well flowed 1,700 M.c.f.d. from perforations at 10,996-11,030 ft. Flow was natural. This becomes South Goodwin's second gas producer.

New find extends Michigan's Scipio

STILL on the same northwest "ruler line" fracture, another major extension of the Albion-Scipio trend in southern Michigan looms.

McClure Oil Co. and Perry Fulk's 1 Winter, NW NE NE 19-2s-4w, Sheridan Township, Calhoun County, flowed oil to pits for 10 minutes on drill stem in Trenton dolomite at 4,158-4,236 ft. Casing will be run at 4,236 ft., present total depth.

Newest sensation in the Trenton

play is 3 miles northwest of the developed area at Albion, up to now the farthest-northwest productive point in the 25-mile-long play. Outpost logged Trenton at 4,111 ft., elevation 980 ft. Trenton is 8 ft. lower than Trenton on McClure and Palmers 1 Ott, NW NW NW 20-2s-4w, located 1,320 ft. east, and completed dry to 4,633 ft. in July 1959.

With other tests drilled the past 30 days virtually assuring connection between the Scipio and Pulaski and Pulaski and Albion pools, all on the same trend, these now-open areas make up about 10 miles of drilled acreage.

Important wildcat completed in Texas

IN WEST TEXAS, Husky Oil Co. et al. announced the final completion and state potential of A1 E. M. Dupree, important wildcat discovery in the South Welch area of Dawson County.

The well flowed 428 bbl. in 24 hours of 39.8°-gravity oil with no water on a 9/64-in. choke. Tubing pressure was 775 psi. and gas-oil ratio 31.5 cu. ft. per bbl.

The well was completed in the Fusselman formation of Silurian age, in perforations from 11,670 to 11,735 ft. and from 11,754-78 ft.

This well is specifically located in C NE NW Section 41, Block M, EL & R.R. survey.

Husky Oil Co., which owns a one-half interest in the block, and which is the operator, announced the location for a second well, 1 Futrell, located in C SW SW Section 40, of the same survey.

Discovery wells

NEBRASKA

Kimball County:

Wyoming Western et al. 1 Hoffman, C SE SE 19-14n-57w. IPP 600 BOPD, "J" sand discovery, new field. TD 7,048 ft.

NEW MEXICO

Lea County:

John M. Kelly 1-SS Federail, 24-18s-35e. IPF 360 BOPD, 18/64-in. choke, 44°, Devonian 12,180-190 ft. TD 12,232 ft. Devonian discovery in Reeves field.

H. S. Moss 3-DB Peck, 26-12s-37e. IPF 273 BOPD, 9/64-in. choke, 49°, Devonian 12,212-20 ft. TD 12,227 ft. Devonian discovery 1½ miles southwest of similar production in Gladiola field.

Ohio Oil Co. 1 State-NPA, 6 miles south of Vacuum field in 6-19s-35e, 15 miles northwest of Monument. IPCAOF 3,750 M.c.f.d., Bend 13,033-073 ft. TD 14,557 ft. New gas field.

OHIO

Perry County:

Taft McGee 1 Andrew Sarvis, Sec. 1, Pleasant Twp. IP 1,210 M.c.f.d., Clinton 3,614-48 ft. Rock pressure 1,200 psi. TD 3,657 ft.

Quaker Thermoid FLOATER HOSE AT WORK IN FROBISHER BAY

Quaker Thermoid **600 foot continuous-length Floater Hose speeds ship-to-shore oil transfer!**

Increased air traffic over the polar route has called for an immense new airfield and oil-piping system at Frobisher Bay, Baffin Island, just completed by Foundation Company of Canada Limited.

Tankers pump petroleum products through a 600-foot Thermoid-Quaker Floater Hose assembly to a 15,000-foot pipeline feeding the huge tank farm at Frobisher. An 8" Thermoid-Quaker discharge hose is floated on special inflatable Thermoid-Quaker pontoons and reeled on a power winch. This three-part rig makes up the complete Thermoid-Quaker assembly.

You do away with bulky metal drums for floating hose when you use this new Thermoid-Quaker rig. Inflatable floats take up less than a quarter of the space formerly required by floating drums. And the hose comes in such long sections that couplings are reduced by as much as 90%.

If you load or unload tankers off-shore, investigate the Thermoid-Quaker Floater Hose combinati n. Ask the Thermoid distributor, or write *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

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PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—COLDFORM DIVISION, DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

Joseph L. Seger
. . . increased problems mean increased opportunities.

Seger Takes Public-Affairs Post

. . . as vice president of Humble in charge of government and public relations. He'll move to Houston next month.

JOSEPH L. SEGER, the quiet, mild-mannered president of the Carter Division of Humble Oil & Refining Co., is taking on a new job.

On June 1 he'll become vice president of Humble in charge of public affairs, a post which will encompass both public relations and government relations.

For the 55-year-old Seger, moving his family from Tulsa to Houston will probably be the biggest change. He's been involved in public, government, and industry affairs for years.

For 6 years he was contact director of Carter in charge of public relations. He's been chairman of the Committee of Pipe Line Companies, which keeps an eye on pipeline affairs in Washington. He's now a director of the Tulsa YMCA and the Chamber of Commerce, and is a director and vice president of the Community Chest.

His friends expect him to take to Houston the same optimism and enthusiasm he's carried to a variety of other Jersey Standard assignments since he joined the organization in 1933.

"I'm convinced that, even today, oil offers great opportunities," Seger says.

"It's one of the large, basic industries in the world of commerce. The demand for petroleum products in the foreseeable future will continue to rise, along with demands for all other kinds of energy.

"This has been called an energy explosion.

"Since we currently have a surplus, we have national and international problems. Along with these problems come increased opportunities in exactly the same ratio. There never has been a better time to get your feet wet in oil."

Seger feels a well-rounded technical education, coupled with some experience in business and management, can make anyone a prime candidate for petroleum leadership.

Timing is less important, he feels, than ability and attitude. Seger joined Carter Oil Co. in the depths of the depression. He'd graduated from Yale in 1929 with a law degree and had practiced law in Tulsa 4 years. He joined Carter as a junior attorney.

By 1946 he had advanced to assistant general counsel and company secretary. He then was made general counsel of Interstate Oil Pipe Line Co. in Tulsa, and in 1950 became its president. A year later Interstate's headquarters, and Seger, moved to Shreveport.

In 1954 Seger returned to Carter as executive vice president. With the merger of Jersey's domestic affiliates into the new Humble company, Seger stepped up to president of the Carter division last December 1, succeeding John Brice, who became an executive vice president of Humble.

Seger married in 1933—the year he joined Carter. There are three children: Mrs. Thomas Webb, of Tulsa; Christian, a senior in Yale law school; and Mary Katherine, who last week was named girl of the month at her Tulsa high school.

When the family moves next month

▶▶▶ Personals

Allen N. DeFriece has joined Sun Oil Co.'s research and engineering staff, Philadelphia. **William Chalpin** has joined Sun's engineering division.

The Houston Geological Society this week will honor four leading members with honorary life memberships. They are **Morgan J. Davis,** president of Humble Oil & Refining Co., **Ira H. Cram,** senior vice president of Continental Oil Co., **Ben C. Belt,** retired Gulf Oil Corp. vice president, and **Shirley L. Mason,** retired Pan American Petroleum Corp. senior staff geologist and currently a geological consultant.

Guy V. Mallonee has been named assistant manager of the New York sales division for Esso Standard Division of Humble Oil & Refining Co. He succeeds **James T. Outz,** who recently was named manager of Humble's new Ohio division.

J. W. Pittman, Shell Oil Co., New Orleans, has been reelected chairman of the Offshore Operators Committee for the Gulf of Mexico. **A. J. Laborde,** Offshore Drilling & Exploration Co., New Orleans, has been elected vice chairman. **Rex Alford,** Continental Oil Co., Houston, was reelected secretary. The committee is made up of 32 offshore lease owners. It conducts joint projects involving weather, safety, navigation aids, emergency rescue, pollution and similar common problems.

to Houston, they'll be towing a sailboat. Seger was a tennis enthusiast until he passed age 45, but since then he's turned to sailing. He expects merely to switch his boating from Oklahoma's Fort Gibson lake to the Gulf of Mexico.

Other changes . . . John Brice, Carter president before the merger, will take back his old title as president of Carter Division.

W. S. Spangler, vice president and general manager of Humble Pipe Line Co., will move up to the presidency. He'll succeed A. E. Pecore, who retired last week after 40 years with the company.

BRICE

SPANGLER

Two other changes in the pipeline company were announced. W. A. Castille, acting assistant general manager, was named vice president for operations, and P. D. Phillips, Jr., assistant general manager, was named vice president in charge of planning and economics.

The change in Brice's job was dictated, at least in part, by his desire to remain in Tulsa. No successor was named to his position as one of three executive vice presidents of the new Humble. Brice will continue as a director of the parent company.

Spangler's promotion climaxes 27 years with the company. He joined the firm as a pipeliner at Longview, Tex., in 1933 after graduation from Carnegie Institute of Technology.

Pecore, the retiring president, joined Humble Pipe Line in 1919 in Houston and became vice president in 1950 and president in 1957.

Alvin E. Hall, assistant to the chief engineer of Sohio Petroleum Co., has been named assistant chief engineer.

H. C. Teasdel, president of The California Co., has been named chairman. **K. H. Shaffer,** chairman of Standard Oil Co. of Texas, another Standard Oil Co. of California subsidiary, has succeeded Teasdel as Calco president. Teasdel is scheduled to retire this summer. He had been president of Calco since 1947 (OGJ, Jan. 4, p. 132).

Jack Hackler, geologist in Denver for Northern Natural Gas Co., has been promoted to senior geologist and transferred to Warren, Ohio.

Ken Stillwell, petroleum engineer with Arabian American Oil Co. in New York, has joined Continental Illinois National Bank & Trust Co. of Chicago as petroleum engineer.

Gavin A. Taylor, assistant manager in the export division of Enjay Co., Inc., has been named advisor on chemicals in the Eastern Hemisphere for Esso Export Corp. He will headquarter in London.

J. E. Butler, assistant Tulsa sales division manager for Skelly Oil Co., has moved up to manager. He succeeds **Russ R. Stamper,** who will retire July 1 after 35 years with the company. **Gordon McAlpine** will succeed Butler. Butler has been with Skelly since 1941 and had been assistant division manager since 1954.

Paul H. Nichols, Shell Oil Co., has been elected president of the East Texas Geological Society, Tyler, Tex. Other new officers are **James C. Dowdy,** Texaco Inc., vice president; **Jack G. Goodwin,** Texaco, executive secretary; **Richard G. McKellar,** British-American Oil Producing Co., treasurer; and **James H. Drewlow,** Cities Service Oil Co., executive committeeman.

Barrie V. Potter has been named head of the automotive fuels section in Esso Research & Engineering Co.'s products research division. **Dr. Jesse B. Patberg,** formerly acting head of the automotive fuels section, has been named head of the marketing technical section, products research division. **Dr. Harry W. Rudel** has been named research associate in products research. **Herbert K. Wiese** has been named research associate, chemicals research division.

A. E. McKay, Continental Geophysical Co., Fort Worth, and **J. P. Woods,** Atlantic Refining Co., Dallas, have been nominated for president of the Society of Exploration Geophysicists. Election will be by mail ballot and new officers will take over at the SEG annual meeting in November. Other nominees include, for first vice president, **John C. Hollister,** Colorado School of Mines, and **W. B. Lee,** Gulf Oil Corp.; for vice president, **Flint Agee,** United Geophysical Corp., and **Robert C. Kendall,** Shell Oil Co.; for secretary treasurer, **George D. Garland,** University of Alberta, and **Francis A. Hale,** California Standard Co.

▶▶▶ Personals

Mike Cheeseman, geologist for Sohio Petroleum Co., has joined Hupp Oil Co., Owensboro, Ky., as geologist.

Dr. J. G. Barney II, formerly with Standard Oil Co. (Ind.), has joined Spencer Chemical Co. as research scientist in Merriam, Kans.

Reed Bell has been named research supervisor in the Emeryville, Calif., research laboratory of Shell Development Co.

Jack D. Duren, petrophysical engineer with Shell Oil Co. in Denver, has been transferred to Roswell, N. M., as division petrophysical engineer.

R. W. Boebel, vice president of Shoreline Exploration, Inc., New Orleans, has resigned to join Oil & Gas Futures, Inc., a new firm. He will be vice president in charge of exploration with headquarters in New Orleans.

Raymond A. Sanborn, assistant supervisor of specialty products in Tidewater Oil Co.'s eastern division, wholesale sales section, has been appointed division commercial sales supervisor. He succeeds **Mark Morrison,** who has retired. In other eastern division appointments, **John E. Barry** has been named area sales supervisor, Wilmington, Del., area. **Peter J. Meade** has been appointed sales coordinator, Richmond, Va., in the southern district.

S. K. Childers, special representative in Phillips Petroleum Co.'s international department, has been named manager of Spain-Spanish Sahara operations for Phillips Oil Co., a subsidiary. Childers will headquarter in Madrid. Others assigned to Spanish operations are **R. E. Beck,** exploration director for Spain; **D. A. Butler,** division geologist for Spain; and **R. H. Ornelas,** division geologist for the Spanish Sahara. Ornelas will headquarter in the Canary Islands.

Arnold F. Kaulakis, director of Esso Research & Engineering Co.'s process research division, has been appointed acting general manager of engineering for the company. Kaulakis has been with Esso Research since 1942 and had been process research director since 1957. In other Esso Research appointments, **Victor F. Massa** has been named engineering associate in the products research division, and **Addison W. Hubbard** has been named research associate, chemicals research division.

Officers Elected by API Mid-Continent District

JOHN D. ALBRIGHT, Cities Service Oil Co., second row, second from left, will head API's Mid-Continent district as chairman this year. Other new officers named at the group's annual meeting in Wichita are, first row, left to right, C. T. Asay, Pan American Petroleum Corp., vice chairman for southwestern Oklahoma; William F. Root, Phillips Petroleum Co., vice chairman for the Arbuckle area; O. C. Atkinson, Cities Service Oil Co., vice chairman for western Kansas. Second row, left to right, T. R. Jones, Gulf Oil Corp., vice chairman for central Oklahoma; Albright; H. A. Nedom, Amerada Petroleum Corp., outgoing district chairman and new district advisory committee chairman; and D. H. Winchell, Sohio Petroleum Co., vice chairman for Golden Trend area. Officers not pictured include Douglas Johnson, Johnson-Fagg Engineering Co., secretary-treasurer; and vice chairmen: Frank Storm, Jr., independent, Texas Panhandle; John Dailey, Humble Oil & Refining Co., Carter Division, Seminole area; and Herman Moss, M.&M. Oil Well Service Co., Drumright area.

A. R. King, reservoir engineer for Atlantic Refining Co. in Midland, Tex., has been promoted to area reservoir engineer in Tyler, Tex.

George F. Feldbauer and **Alan R. Cunningham** have been named engineering associates for Esso Research & Engineering Co. Both are in the petroleum development division.

Dr. Robert H. Elkins has joined Nalco Chemical Co. as manager of corporate research. Elkins was with Borg-Warner Corp.'s research center as manager of organic and polymer chemistry before joining Nalco. He also has been with Standard Oil Co. (Ohio), Great Lakes Carbon Co., and Sinclair Research Laboratories.

Leonard F. McCollum, president of Continental Oil Co., has been named chairman of a five-member Export Expansion Committee set up by Secretary of Commerce **Frederick H. Mueller.** The committee will encourage and organize private industry efforts to expand American export trade. McCollum currently is a vice chairman of the Commerce Department's Business Advisory Council and is chairman of its Committee on International Trade and Commerce.

D. C. (Tom) Hurst, assistant district superintendent in the Magnolia, Ark., production office of Humble Oil & Refining Co.'s Carter Division, has been named district superintendent in Jackson, Miss. He succeeds **E. A. Rose,** who will retire May 1 after 41 years with the company.

J. D. Brian has been promoted to senior coordination technician in the coordination division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. **C. W. Lubbock** and **Roger Wylie** have been named staff engineers. **D. L. Guthrie** has been named senior chemical engineer and **T. B. Brister,** senior mechanical engineer, in the technical division. **C. L. Cox, J. F. Barker,** and **D. D. Roselius** have joined the Baytown technical division.

▶▶▶ Personals

E. D. Cole, district engineer for Superior Oil Co. in Crossville, Ill., has been promoted to district superintendent there.

Ronald David Baker has joined Humble Oil & Refining Co.'s Carter Division as engineer trainee in St. Elmo, Ill.

C. F. (Chet) Whaley, formerly president of Chet Whaley Well Servicing Co., Inc., Houston, will join Columbia Drilling Co., Houston, May 1 as vice president.

Homer A. Martin, Jr., petroleum engineer with Mobil Oil Co. in Pampa, Tex., has been transferred to Wichita Falls, Tex., as junior production engineer.

Dr. Norris Johnston has been named director of research for Tekoil Corp., a new position. He will continue as president of Petroleum Technologists, Inc., a Tekoil subsidiary. **Robert E. Lampkin,** general manager of Petroleum Technologists, has been named a vice president of that company.

Garland Davis, manager of marketing technical services for Esso Research & Engineering Co., has been appointed manager of a new marketing technical division. **Al Blackwood** has been named assistant manager, product application, for the new division. **Stewart Hulse** will be assistant manager, product planning. New division will handle marketing technical service activities formerly carried out by the products research division and products committee.

Harry B. Nason, Sun Oil Co., has been named staff assistant to the president of SunOlin Chemical Co. **Nicholas A. Collora,** Olin Mathieson Chemical Co., has been appointed mechanical engineering assistant to **Richard D. Burt,** who is in charge of SunOlin's engineering planning.

Dr. Daniel A. Busch, Tulsa consulting geologist, will receive awards this spring from both his alma maters and the American Association of Petroleum Geologists. He will be granted an honorary doctor of science degree from Capital University, Columbus, Ohio, and will receive Ohio State University's Orton award honoring distinguished geology alumni. He will be given AAPG's Matson award at the group's annual meeting this month. Busch holds a bachelors degree from Capital and M.A. and Ph.D. degrees from Ohio State.

▶▶▶ Personals

Roger M. Matson has been named chief geologist of Vickers Petroleum Co., Inc. He will headquarter in Denver. Matson has been consulting geologist for Vickers since September. He is a former vice president of Alex McCoy Associates and also has been with Gulf Oil Corp.

William B. Padon, Tulsa, vice president, a director and member of the executive committee of Transwestern Pipeline Co., has been elected vice president in charge of administrative affairs. He will headquarter in Houston. Padon has resigned as vice president and a director of Warren Petroleum Corp. to devote full time to the Transwestern post. Transwestern is owned jointly by Warren, J. R. Butler & Associates, and Monterey Oil Co.

J. French Robinson, retired chairman of Consolidated Natural Gas Co., and **John M. Harbert III,** president of Harbert & Cargil, Inc., have been elected directors of Houston Corp.

Russell T. Tutt, Colorado Springs, Colo., has been elected a director of Colorado Interstate Gas Co. He succeeds the late F. T. Parks.

Randall T. Klemme, vice president of marketing, research, and area development for Northern Natural Gas Co., has been elected to a 2-year term as a director of the American Industrial Development Council.

Harry P. Letton, general attorney and a director of Southern California Gas Co., has been elected vice president and general counsel. He succeeds **T. J. Reynolds,** who has retired.

D. E. Miltner, district superintendent for Magnolia Pipe Line Co., has been transferred to Augusta, Kans., from Topeka, Kans.

Paul G. Luckhardt, evaluation engineer for Sohio Petroleum Co. in Okmulgee, Okla., has joined Oilfield Research, Evansville, Ind., consulting firm.

Hal M. Hart, assistant superintendent of technical service at the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been appointed a project director at Indiana Standard's Whiting laboratories. He will be responsible for developing new ways to use electronic computers in controlling selected refining processes.

Howard Wilson, assistant superintendent of the Eagle Point refinery of Texaco Inc., Westville, N. J., has been named supervisor of Texaco's process and production division in Houston. **Robert R. Dimock,** supervisor of operations in Westville, will succeed Wilson there.

Benjamin Tyran, general sales manager for American Independent Oil Co., has resigned to form International Petroleum Supply Co. The new company will be concerned with International purchase and sale of crude oil and products. Tyran served as a director of Iricon Agency, Ltd. London, and Frisia Refining Co., Emden, Germany, while he was with Aminoil.

Max C. Sons, vice president, production and drilling, and a director of Jersey Production Research Co., has resigned to join Standard Oil Co. (N. J.), the parent company, as assistant chief petroleum engineer, producing coordination department. He will headquarter in New York. **Edwin C. Holmer,** manager of the production division for Jersey Production Research, will succeed Sons as vice president and a director. Sons had held the Jersey Production post since 1958. He had been assistant chief of research and chief petroleum engineer for Humble Oil & Refining Co.'s Carter Division before that time. Holmer was assistant director of the chemical research division for Esso Research & Engineering Co. before joining Jersey Production Research last year.

SONS

W. K. Brown has been appointed assistant manager, projects, and **Ben Franklin** has been named assistant manager, contracts, construction, and estimating in the general engineering department of Standard Oil Co. (Ind.).

Guy E. Campbell has been named acting division manager of Sun Oil Co.'s Mid-Continent division. He succeeds the late George W. Chapman. **Jack G. McQueen** has been named acting manager of the Mid-Continent division land department, succeeding Campbell.

▶▶▶ Deaths

Jesse D. Davis, 59, vice president of United Gas Corp., died March 30 in Shreveport, La. Davis had been with United Gas and its affiliates for 35 years. He had been western division superintendent for United Gas Pipe Line Co., a director of the pipeline company, and assistant to the president of United Gas Corp. before being elected a vice president last year.

Tom N. Wilson, 52, manager of Brazos Oil & Gas Co.'s land department, died March 29. He had been with Brazos since 1950.

Harry Cain, 60, assistant to the public relations director of United Gas Corp., died March 26 at his home in Shreveport. Cain joined United Gas in 1936. He had been manager of the Longview, Tex., district and assistant Beaumont, Tex., division manager before moving to the public relations department in Shreveport.

Jack W. Prothro, 43, exploration manager in the Billings, Mont., office of Honolulu Oil Corp., died March 31 in a Billings hospital. Prothro had been with Honolulu in Billings since 1952. He was named exploration manager there in 1955.

Ralph Waldo Johnston, 60, general superintendent of Cities Service Oil Co.'s natural gas division, died April 3 at his home in Bartlesville, Okla., after a heart attack. Johnston had been with Cities Service since 1923.

Dr. Charles Weldon Tomlinson, 67, Ardmore, Okla., geologist and independent operator, died April 3 at his home in Ardmore. Tomlinson was a past national president of American Association of Petroleum Geologists.

James Murphy, assistant drilling supervisor of Creole Petroleum Corp.'s Tia Juana district, was killed March 29 in Venezuela. He had been with Creole since 1947.

Fred A. Butland, assistant manager of Richfield Oil Corp.'s land and lease department, died March 31.

T. Ellwood Webster, president of Catalytic Construction Co., died April 1 in Philadelphia after a long illness.

Interstate Shipments of Crude—1959

(Thousands of barrels daily)

Destination—	Shipped from— Texas	Rocky Mtn.*	Louisiana	New Mexico	Oklahoma	Ala.-Miss.	Kans.	Other	Total interstate
Del.-Mass.-R.I.	43.5		30.7			3.3		4.8	82.3
Fla.-Ga.-S.C.-Va.	0.4					3.8		0.9	5.1
N.J.-Md.	106.9		35.3	0.4		11.4		4.2	158.2
N.Y. (West)	23.5	3.6			10.7		0.9	11.3	50.0
Pa. (East)	179.0		45.6			10.7			235.3
Pa. (West)	4.7	3.0			1.1			6.5	15.3
W. Va.								2.6	2.6
Dist. 1	**358.0**	**6.6**	**111.6**	**0.4**	**11.8**	**29.2**	**0.9**	**30.3**	**548.8**
Ill.	270.5	59.4		12.9	80.5		31.5	4.5	459.3
Ind.	93.1	143.0		13.2	92.2		64.9	17.7	424.1
Kans.	7.8	15.0		13.7	26.8				63.3
Ky.-Tenn.	4.3		7.8			6.1		16.4	34.6
Mich.	32.1	52.2			2.6		2.5	16.4	105.8
Minn.-Wisc.		15.0							15.0
Mo.	20.3	4.7		28.2	1.9		0.1		55.2
Neb.		2.5							2.5
Ohio (East)	2.6	0.7			5.9	5.7	0.9	75.9	91.7
Ohio (West)	127.6	19.7	44.2	4.1	27.8	0.6		48.0	272.0
Okla.	61.2	20.7		2.0			28.6		112.5
Dist. 2	**619.5**	**332.9**	**52.0**	**74.1**	**237.7**	**12.4**	**128.5**	**178.9**	**1,636.0**
Ala.-Miss.			0.9			5.9		1.0	7.8
Ark.			2.4						2.4
La.	83.2	1.2			0.1	86.8		26.4	197.7
Texas		9.7	270.9	155.7	9.5	2.9			448.7
Dist. 3	**83.2**	**10.9**	**274.2**	**155.7**	**9.6**	**95.6**		**27.4**	**656.6**
Col.		30.2		0.2					30.4
Mont.		46.7							46.7
Utah		69.8		0.5					70.3
Wyo.		6.6							0.6
Dist. 4		**153.3**		**0.7**					**154.0**
Calif.		33.4		20.2				0.4	54.0
Ore.-Wash.		0.3		9.7				10.0	20.0
Dist. 5		**33.7**		**29.9**				**10.4**	**74.0**
Total U. S.	**1,060.7**	**537.4**	**437.8**	**260.8**	**259.1**	**137.2**	**129.4**	**247.0**	**3,069.4**

*Col., Mont., Neb., N. & S. Dak., Utah, Wyo.

Where crude came from . . . and went

BY JOHN C. CASPER

THE LARGEST interstate crude-oil market in this country is in the areas just south of the Great Lakes. Shipments of crude into Illinois and Indiana averaged 883,400 bbl. daily in 1959. This total represented 28.8% of all interstate shipments of crude during the year. If the western half of Ohio is included in the area, the total rises to 37.6% of all interstate crude.

There are several reasons for the large crude movement to the general Chicago area.

. . . The states are highly industrialized and densely populated.

. . . Energy consumption is high in the area.

. . . Petroleum refining has increased rapidly to help supply energy requirements.

. . . The area has limited petroleum production.

. . . Crude imports from Canada have supplied only a small part of the demand for crude.

All of these factors add up to a heavy movement of crude into the area from the south and west.

Last year more domestic crude was shipped into Illinois, Indiana, and West Ohio than was shipped out of Texas.

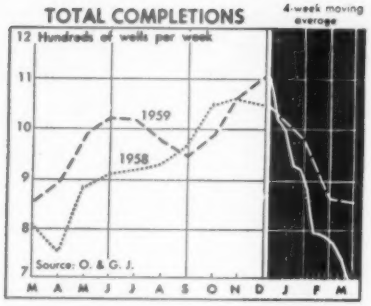
Interstate shipments of domestic crude for 1959 are shown in the table on this page. Major shipping states and areas are listed at the top and receiving states are on the left. For example, Kansas shipped 28,600 bbl. daily of crude to Oklahoma and Oklahoma shipped 26,800 bbl. daily to Kansas.

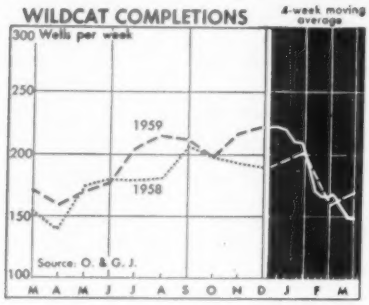
The table is tabulated from Bureau of Mines monthly reports. Note that crude shipments across state lines averaged 3,069,400 bbl. daily last year or 43.5% of total crude production for the year.

Texas shipped 34.6% of all interstate crude last year, and despite its high production rate this state ranked second in interstate receipts.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,172,255	UP	50,545	DOWN	92,670
Crude stocks	257,581,000	UP	1,715,000	UP	5,193,000
Completions	711	UP	87	DOWN	140
Refinery runs	7,916,000	DOWN	29,000	DOWN	283,000
Gasoline stocks	225,595,000	DOWN	392,000	UP	11,980,000
Kerosine stocks	17,538,000	DOWN	561,000	DOWN	1,078,000
Distillate stocks	75,119,000	DOWN	2,893,000	DOWN	3,832,000
Residual stocks	39,112,000	DOWN	740,000	DOWN	19,769,000
Four-product stocks	357,364,000	DOWN	4,586,000	DOWN	12,699,000
Total imports	1,837,400	UP	247,900	DOWN	432,800





Active Rotary Rigs

	4-4-60	3-28-60	4-6-59
Alabama	4	4	7
Alaska	†5	(†)	(†)
Arkansas	17	12	13
Arizona	4	4	1
California	81	85	95
Land	77	83	93
Offshore	4	2	2
Colorado	23	20	33
Florida	2	2	3
Land	1	1	2
Offshore	1	1	1
Illinois	21	15	23
Indiana	2	4	10
Iowa	0	0	3
Kansas	97	77	136
Kentucky	1	4	8
Louisiana	296	296	334
North	29	28	36
S. Inland waters	125	131	142
S. Land	89	89	115
Offshore	53	48	41
Maryland	0	0	0
Michigan	33	34	17
Mississippi	55	59	61
Missouri	1	1	0
Montana	12	12	20
Nebraska	26	22	17
Nevada	0	0	0
New Mexico	108	102	100
New York	1	2	1
North Dakota	21	18	47
Ohio	5	4	0
Oklahoma	197	195	238
Oregon	0	0	0
Pennsylvania	11	11	9
South Dakota	2	2	2
Texas	635	610	768
S. Inland waters	8	7	10
S. Land	175	171	177
Offshore	2	2	1
North-East	47	41	151
Panhandle	65	60	(*)
East	55	53	(*)
West Central	187	183	273
West	96	93	156
Utah	27	28	36
Washington	0	0	0
West Virginia	4	5	5
Wyoming	55	51	50
Total U. S.	**1,746**	1,679	2,037
Western Canada	140	180	132
Eastern Canada	2	2	0
Grand total	1,888	1,861	2,169

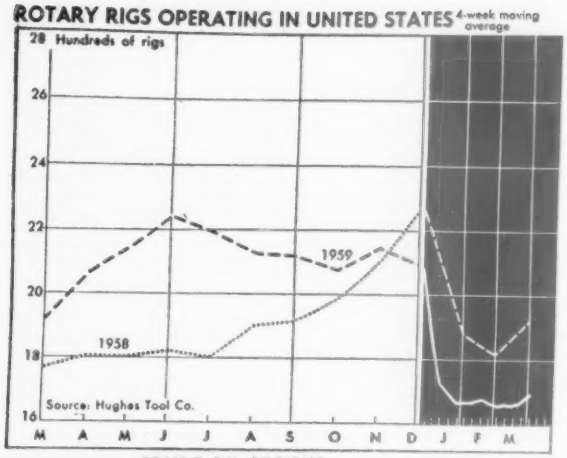
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported for 4-4-60.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 2, 1960

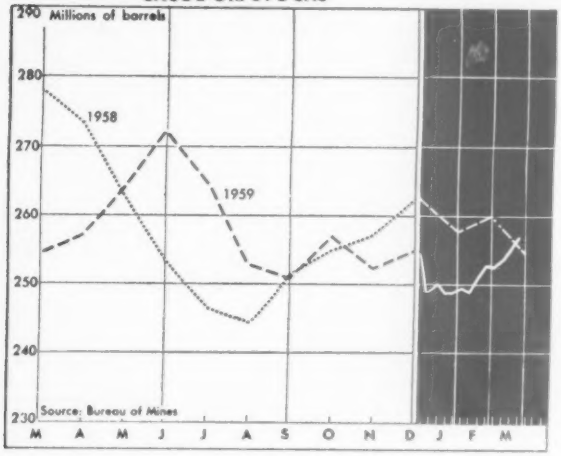
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	1	1	0	0	0	0	11,556	15	29	0	0	0	0	0	1	5
Arizona	0	0	0	0	0	0	0	6	.....	0	0	0	0	0	6	.....
Arkansas	10	4	0	0	6	0	50,441	144	234	3	0	0	0	3	37	41
California	24	16	0	1	7	0	117,817	333	390	3	0	0	0	3	73	96
Colorado	12	2	0	0	10	0	54,172	180	188	7	0	0	0	7	83	109
Illinois	29	14	0	0	15	0	59,074	552	549	0	0	0	0	0	146	90
Indiana	14	2	0	0	12	0	20,486	219	166	9	0	0	0	9	94	55
Kansas	52	23	0	4	24	1	186,805	819	1,032	22	3	0	1	18	267	232
Kentucky	20	11	0	2	7	0	25,119	486	413	4	1	0	1	2	59	47
Louisiana	68	23	7	5	33	0	658,720	832	920	19	2	0	0	17	122	122
North	18	7	0	4	7	0	110,712	264	334	6	2	0	0	4	50	56
South	39	13	5	1	20	0	433,408	423	487	10	0	0	0	10	63	62
Offshore	11	3	2	0	6	0	114,600	145	99	3	0	0	0	3	9	4
Michigan	10	5	0	1	4	0	33,098	185	140	3	0	0	1	2	58	43
Mississippi	12	8	1	0	3	0	135,485	204	167	2	0	0	0	2	68	76
Montana	3	1	0	0	2	0	16,106	62	69	2	0	0	0	2	32	29
Nebraska	20	6	0	0	14	0	118,239	191	187	6	0	0	0	6	77	84
New Mexico	29	24	0	2	3	0	123,718	477	441	1	1	0	0	0	64	45
West	7	5	0	2	0	0	32,127	155	.....	0	0	0	0	0	13	.....
East	22	19	0	0	3	0	91,591	322	.....	1	1	0	0	0	51	.....
New York	25	13	0	1	4	7	40,638	97	97	0	0	0	0	0	5	8
North Dakota	6	5	0	0	1	0	28,428	81	112	0	0	0	0	0	12	28
Ohio	17	7	0	3	7	0	46,766	282	235	1	0	0	1	0	14	5
Oklahoma	55	29	0	6	19	1	261,043	932	1,504	8	3	0	1	4	181	237
Pennsylvania	0	0	0	0	0	0	0	128	114	0	0	0	0	0	6	3
South Dakota	1	0	0	0	1	0	8,615	12	.....	0	0	0	0	0	4	.....
Texas	288	146	11	6	118	7	1,184,900	4,035	4,866	68	5	1	0	62	830	944
Dist. 1	31	12	0	2	17	0	94,487	290	314	14	0	0	0	14	104	83
Dist. 2	18	5	3	2	8	0	121,928	175	189	1	0	0	0	1	43	58
Dist. 3	14	7	2	0	5	0	102,370	307	260	1	0	0	0	1	59	71
Dist. 4	25	6	4	1	14	0	127,792	313	309	9	0	1	0	8	95	89
East	19	10	1	0	8	0	80,533	302	285	3	0	0	0	3	61	64
Dist. 7-B	40	17	0	0	22	1	123,722	580	664	15	1	0	0	14	169	178
West	75	51	0	0	21	3	357,273	1,053	1,549	18	1	0	0	17	168	185
Dist. 9	52	26	0	1	22	3	116,695	751	936	7	3	0	0	4	109	183
Dist. 10	14	12	1	0	1	0	60,100	264	360	0	0	0	0	0	22	33
Utah	3	0	0	0	3	0	18,619	68	99	3	0	0	0	3	25	26
West Virginia	0	0	0	0	0	0	0	200	191	0	0	0	0	0	1	6
Wyoming	12	5	0	0	7	0	73,305	243	224	7	1	0	0	6	102	77
Miscellaneous	0	0	0	0	0	0	0	12	20	0	0	0	0	0	10	16
Total U. S.	**711**	345	19	31	300	16	3,273,150	10,795	12,387	**168**	16	1	5	146	2,377	2,424
Previous week	624	300	23	41	250	10	2,886,837	.....	.....	139	11	1	3	124	.....	.....
Cum. 1960	10,795	5,059	350	913	4,155	318	47,340,421	.....	.....	2,377	216	22	70	2,069	.....	.....
Cum. 1959	12,387	6,247	314	849	4,643	334	52,209,724	.....	.....	2,424	254	34	82	2,054	.....	.....
Western Canada	45	21	0	3	21	0	270,392	640	656	21	0	0	2	19	199	248

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	3-26-60	3-19-60	3-28-59
Pennsylvania	2,072	2,149	2,539
Other Appalachian	1,825	1,947	1,475
Illinois, Indiana, Michigan	9,319	9,316	8,599
Nebraska and North Dakota	2,730	2,653	2,202
Kansas	9,487	9,241	8,540
Oklahoma	16,842	16,395	17,563
Arkansas	2,042	1,929	2,025
Louisiana	19,218	18,970	18,190
North	3,252	3,150	3,176
South	15,966	15,820	15,014
Mississippi, Alabama, Florida	2,931	2,995	2,369
New Mexico	7,329	7,675	8,483
Texas	112,097	111,574	109,899
East Texas	8,617	8,507	9,443
West Texas	50,836	50,435	54,103
Texas Gulf	20,569	20,149	17,229
Other Texas	32,075	32,483	29,124
Wyoming	17,522	17,234	13,516
Other Rocky Mountain	9,657	9,686	9,407
California	†29,975	29,461	34,494
Foreign	14,535	14,641	15,057
Total	**257,581**	255,866	254,358

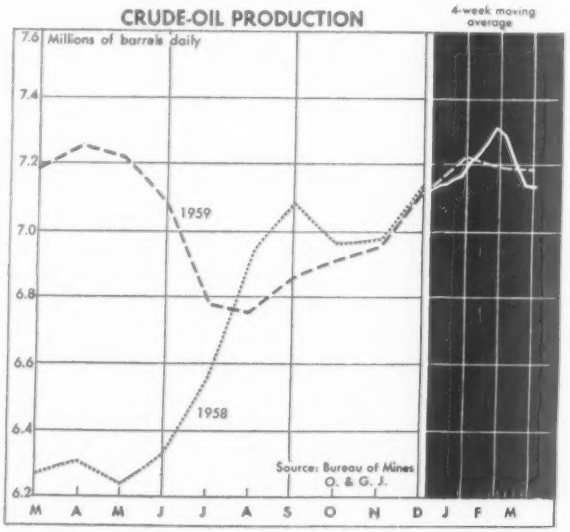
*Bureau of Mines. †Includes 4,414,000 bbl. in California.

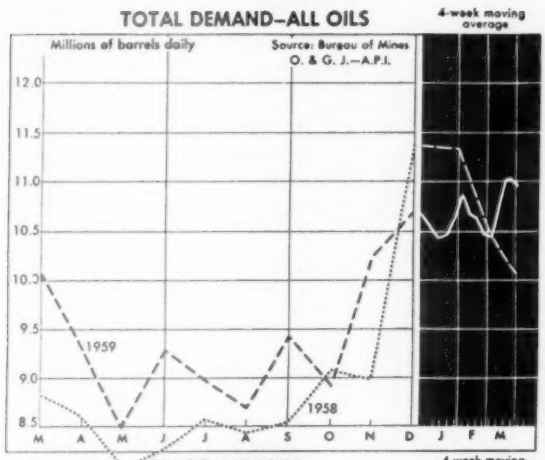
DAILY AVERAGE PRODUCTION FOR WEEK

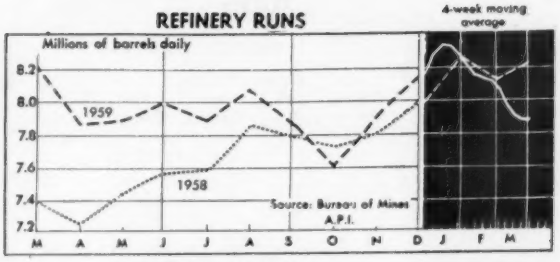
	April 2, 1960			Mar. 26
	Crude oil	Lease condensate	Total	total
Alabama	19,300	.....	19,300	19,400
Arkansas	82,475	150	82,625	82,500
California	826,000	.....	826,000	827,500
Colorado	128,900	.....	128,900	128,300
Eastern	39,000	.....	39,000	39,500
Florida	1,200	.....	1,200	1,200
Illinois	218,000	.....	218,000	217,300
Indiana	33,400	.....	33,400	32,700
Kansas	†323,930	.....	†323,930	†270,360
Kentucky	62,200	.....	62,200	62,000
Louisiana	962,800	133,500	1,096,300	1,096,250
North	107,800	6,000	113,800	113,750
South	855,000	127,500	982,500	982,500
Michigan	31,800	.....	31,800	31,800
Mississippi	134,100	4,225	138,325	138,325
Montana	79,400	.....	79,400	80,500
Nebraska	61,000	.....	61,000	60,500
Nevada	100	.....	100	100
New Mexico	306,600	8,500	315,100	315,100
North Dakota	52,000	.....	52,000	51,400
Oklahoma	†552,100	.....	†552,100	†548,500
Texas	2,583,000	91,625	2,674,625	2,674,625
District 1	41,000	3,500	44,500	44,500
District 2	114,000	9,100	123,100	123,100
District 3	325,000	38,000	363,000	363,000
District 4	190,000	17,000	207,000	207,000
District 5	29,000	500	29,500	29,500
District 6	114,000	10,000	124,000	124,000
East Texas field	139,000	.....	139,000	139,000
District 7-B	137,000	300	137,300	137,300
District 7-C	127,000	3,525	130,525	130,525
District 8	1,067,000	6,000	1,073,000	1,073,000
District 9	192,000	2,400	194,400	194,400
District 10	108,000	1,300	109,300	109,300
Utah	110,600	.....	110,600	111,500
Wyoming	325,000	.....	325,000	331,000
Others	‡1,350	.....	‡1,350	‡1,350
Total U. S.	6,934,255	238,000	**7,172,255**	7,121,710
Change from prev. week, up			**50,545**	
Canada	†546,600	.....	†546,600	†593,100
Total U. S. Prod.-Jan. 1-Apr. 2				670,170,350 bbl.
Same period last year (crude plus cond.)				*662,729,900 bbl.

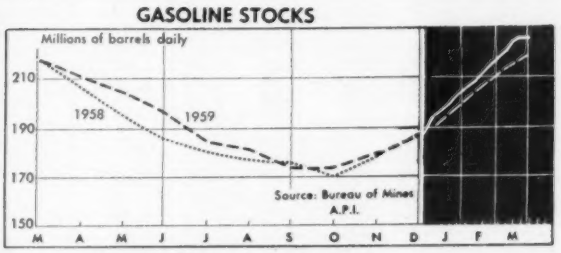
*Includes 17,880,900 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

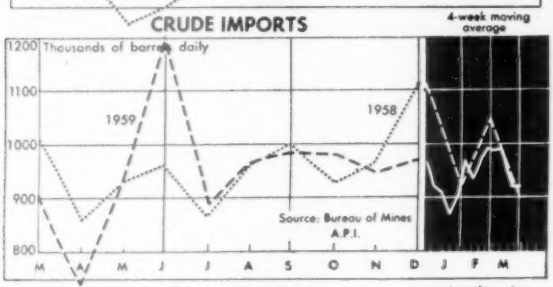
CRUDE-OIL PRODUCTION

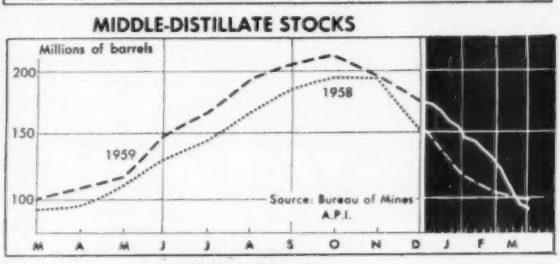


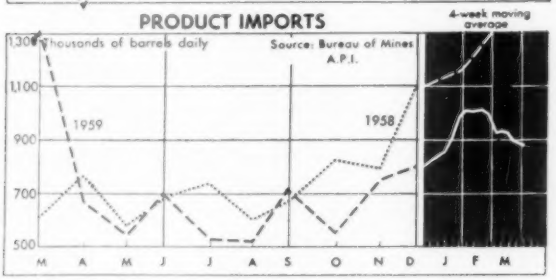

TOTAL DEMAND—ALL OILS
Millions of barrels daily
Source: Bureau of Mines
O. & G. J.—A.P.I.
4-week moving average
1959
1958
M A M J J A S O N D J F M

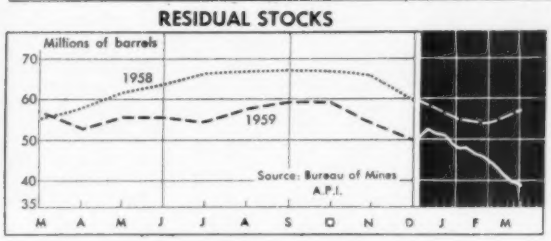












API REFINERY REPORT—APRIL 1, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,199	514.0	43.1	364.9	169.3	45,812	6,725	23,380	9,858	1,114	489.4	35.1	304.8	167.2
Appalachian:														
District 1	102	40.3	4.0	26.7	13.6	6,117	424	1,807	269	84	31.7	2.9	19.2	8.7
District 2	88	28.6	9.4	17.6	16.9	2,958	251	687	440	91	42.3	5.5	16.5	11.8
Ind., Ill., Ky.	1,487	741.6	80.3	349.8	199.1	44,446	3,042	11,230	3,378	1,421	723.0	68.0	286.5	156.3
Minn., Wis., Dak.	102	52.0	3.7	22.7	18.4	6,824	487	2,332	587	92	43.4	5.6	21.4	11.9
Okla., Kans., Mo.	675	372.0	9.6	159.1	29.1	23,185	707	7,163	913	698	353.5	16.1	158.9	17.5
Inland Texas	270	188.1	11.1	47.4	19.3	7,786	487	1,549	2,378	261	192.8	6.4	47.9	20.5
Tex. Gulf Coast	1,889	978.5	92.6	444.4	136.4	28,938	2,037	8,644	5,289	1,904	966.5	77.8	472.1	164.5
La. Gulf Coast	628	393.6	56.3	157.4	39.0	12,595	1,597	2,685	673	689	363.8	45.3	150.3	43.4
N. La. and Ark.	95	42.1	3.9	20.3	5.7	6,299	293	2,374	128	106	49.0	5.1	22.8	6.3
Rocky Mtn.:														
New Mexico	25	14.9	0.6	4.4	3.1	853	51	150	167	21	11.9	0.3	4.0	2.1
Other	267	141.7	4.4	59.6	34.1	8,059	206	2,238	848	251	110.1	1.6	55.9	31.5
West Coast	1,089	487.4	25.9	196.0	288.8	31,723	1,231	10,880	14,184	1,136	508.4	6.0	179.4	295.3
Apr. 1, 1960	7,916	3,995.1	344.9	1,870.2	972.9	225,595	17,538	75,119	39,112	7,868	3,885.8	275.7	1,739.7	937.0
Mar. 25, 1960	7,945	4,000.4	375.7	1,835.1	1,039.7	225,987	18,099	78,012	39,852	.....	.....	.....	.....	.....
Apr. 3, 1959	8,199	4,057.9	312.0	1,969.1	971.1	213,615	18,616	78,951	58,881	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	West Tex. (sour)	West Tex. (Inter.)	No. Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.55
Middle District	4.37
Southwest Pennsylvania	4.10
West Virginia	3.92
Buckeye Grade	3.77
Illinois Basin	**3.00**

Foreign

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.90
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS +5.0%)	$2.99
★ Gulf-NY, dirty (ATRS −10.0%)	2.57
★ Carib.-NY, dirty (ATRS −55.0%)	1.24
★ PG-Japan, dirty (USMC −75.0%)	2.55

★ Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
★ Regular (91 octane)	11.00-11.50
★ Premium (99 octane)	13.50-14.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25-10.50
Regular (92 octane)	10.50-10.75
Premium (98 octane)	11.25-11.75
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):	
★ Kerosine 42-44	9.00-9.50
★ Diesel oil (58 d.i. and above)	8.75-9.25
★ Distillate No. 1	8.75-9.25
★ Distillate No. 2	7.75-8.25
Gulf Coast (cargoes):	
Kerosine 41-43	8.75- 9.00
Distillate No. 2	7.75- 8.00
New York Harbor (barges):	
Kerosine 41-43	9.8-10.3
Distillate No. 2	8.8- 9.3
Diesel fuel, 48-52 d.i.	9.1- 9.6
Caribbean area (cargoes):	
Distillate No. 2	8.00

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.70-1.80
Gulf Coast (cargoes):	
★ Bunker C fuel	2.10-2.20
New York Harbor (barges):	
★ Bunker C fuel	$2.47
Caribbean (cargoes):	
★ Bunker C	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15

★ Denotes change from previous week.

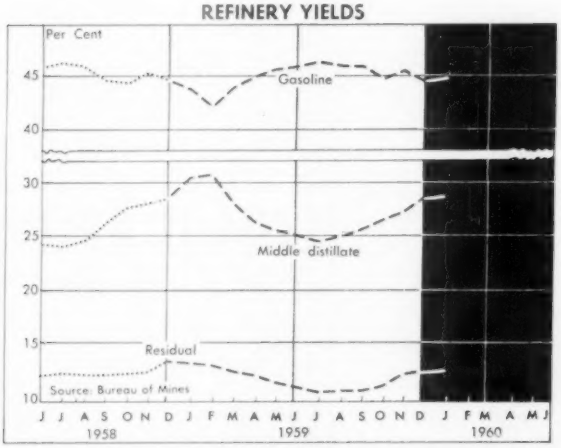
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

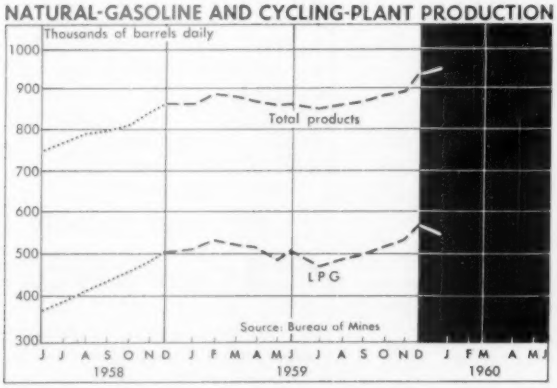
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
March 1960*	3,830	3,985	225,600
February 1960*	3,720	4,080	217,500
January 1960	3,654	4,184	205,982
April 1959	4,239	3,886	210,395
March 1959	3,880	4,030	218,612
KEROSINE			
March 1960*	525	350	17,540
February 1960*	435	315	21,150
January 1960	479	437	26,510
April 1959	200	276	21,003
March 1959	346	306	18,688
DISTILLATE			
March 1960*	2,800	1,810	75,120
February 1960*	2,540	1,820	104,660
January 1960	2,806	1,931	125,924
April 1959	1,621	1,739	86,222
March 1959	2,214	1,987	80,662
RESIDUAL			
March 1960*	2,000	1,015	39,110
February 1960*	1,950	1,000	44,600
January 1960	2,042	1,047	49,306
April 1959	1,590	937	53,327
March 1959	1,999	1,051	57,210

*Preliminary. †Thousands of barrels.

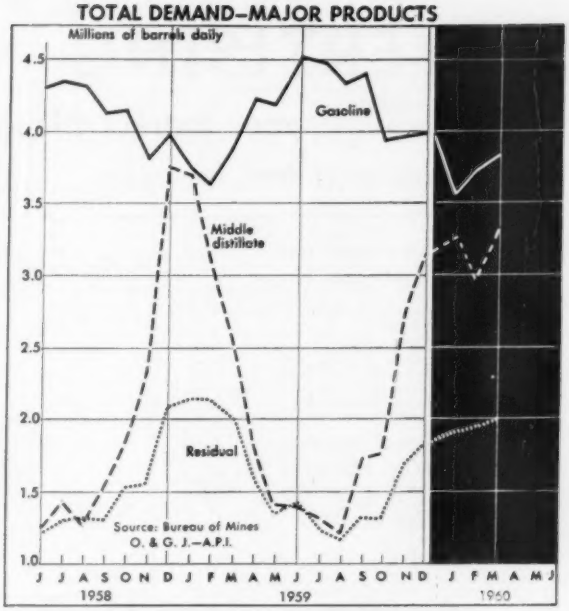
REFINERY YIELDS



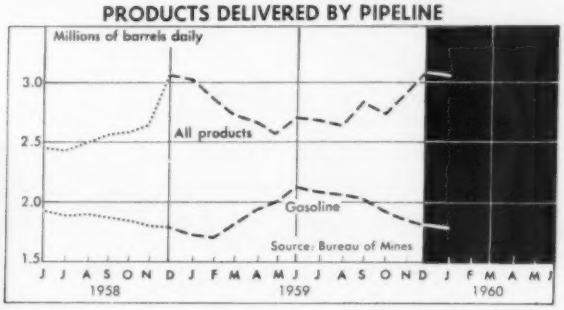
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



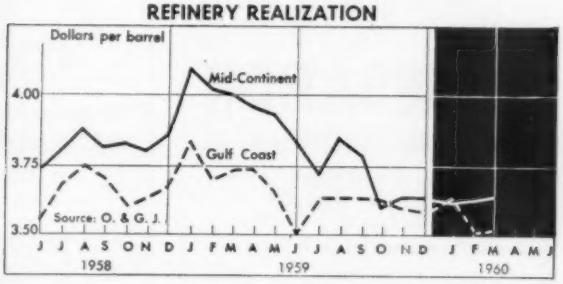
TOTAL DEMAND–MAJOR PRODUCTS



PRODUCTS DELIVERED BY PIPELINE



REFINERY REALIZATION



REFINERY REALIZATION

	Mar.* 1960	Feb.* 1960	Jan. 1960	Mar. 1959
Mid-Continent	$3.64	$3.63	$3.59	$4.00
Gulf Coast	3.52	3.51	3.68	3.73

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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9"x9" Ingersol-Rand ES-1 with MZAU Waukesha engine, fabricated by Wilson & Co., new condition. Maximum discharge on cylinder 100#, $6,000

8"x13" Gardener-Denver, new condition, with brand new Catipillar G 342 Engine. Maximum discharge 750#. Equipped with all extras. Fabricated by IFS, $15,500

4¼"x9" Ingersol-Rand ES-1 with D-1000 LeRoi Engine. Maximum discharge 500#. Fabricated by IFS, $6,000

(Any of the above cylinders could be changed to any desired size and discharge pressure.)

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6⅛"x11" Ingersol-Rand. Discharge pressure 440#, tested 660#
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BOILERS, 70,000 #/hr. & 80,000 #/hr. 450 Psi.
HORTONSPHERES, 5,000 & 10,000 bbl.
EXCHANGERS, 78 to 2,800 sq. ft.
TOWERS, 3 ft. to 7½ ft. diameter.
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FURNACES, 26 MM BTU/hr.
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CENT. PUMPS, 15 to 7,000 GPM.
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COMPRESSORS, (IR) XVG—4 & XVG—2.

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All J-55 SEAMLESS—U. S. A. Made

100,000'—2" regular 10-rd. thrd. 4.6# @ .45 ft.
50,000'—2" upset 4.6# @ .55 ft.
40,000'—2½" upset 6.4# @ .78 ft.
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For sale at prices quoted . . . or will trade for share in production runs.

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2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
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400,000 ft.	10¾"	35#
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All No. I Grade plain end and cleaned.

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April 20th
Of Two Rigs

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Bids subject to confirmation by Referee in Bankruptcy.

For further information or inspection contact:

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310 Beacon Bldg., Tulsa, Oklahoma
Phone LUther 2-9201

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18" AND 20" good used pipe. Very attractive prices. Contact: The Tri-State Pipe Co., Bellaire, Ohio. Telephone OR 6-1452.

FOR SALE: Blaw-Knox Packaged Gasoline Stripping Plant, capacity: 5 million cubic feet per day. Complete less storage tanks. Location Central Oklahoma. Okla. Resources Development Co., Box 3966, Okla. City 6, Okla

COMPLETE ROTARY DRILLING RIG Brewster N3 with 86 ft. portable mast. For sale ready to drill. Capacity 3,500 ft. Includes 4½" drill pipe, mud pump and engine, water pump, light plant, tool house, oil-bath rotary table, drill collars, kellys, traveling block and other equipment necessary to drill. For complete inventory, write: Box L-792, The Oil and Gas Journal, Box 1260, Tulsa, Oklahoma.

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COMPRESSORS, Clark Gas RA-5; Clark Cent. 7,860 CFM 2 Stage
CONDENSERS 7,500 to 100 sq. ft.
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PRESSURE VESSELS 3' to 12' Dia.
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1,000 ft. Mayhew rotary with 38 ft. mast, fully equipped. Cable tool core barrel, 1 sand pump, K8 International tandem, pole trailer, 1 Cooper pulling unit, 6 x 6 Wheatley pump. Call 758 or 871 Caney, Kansas or write Box 363.

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PRODUCTION SUPERINTENDENT
or
PETROLEUM ENGINEER

Must be experienced in all phases of production, water-flooding, drilling, well completion and workover in Oklahoma. Salary open. Address reply: Box 1160, Tulsa, Oklahoma.

PETROLEUM ENGINEER

For immediate opening with Denver-Based Independent Oil Company operating in Colorado, Wyoming, Nebraska, New Mexico, Oklahoma and Canada. Job requires considerable field work. Applicants should have B. S. Degree and three to five years actual field experience in drilling, completing, and producing oil and gas wells. Submit complete educational and experience history and state salary requirement and family status. Snap shot or small photograph desirable. Our employees know of this ad.

Reply Post Office Box 8331
University Park Station, Denver 10, Colorado.

GEOLOGISTS

Medium size integrated oil company has openings for two capable geologists between 28 and 40 years of age. One must have varied experience in south Louisiana; the other in south Texas area. Salary range of $9,000 to $13,000. Submit resume, including references, recent photograph and salary requirements to:

BOX L-783
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

All replies are strictly confidential, and our employees know of this advertisement.

REFINERY MAINTENANCE: Two men, one possibly for Maintenance Superintendent, with several years general experience in all phases refinery maintenance: covering, welding, pipe fitting, pump and compressor repairs, instrument, electrical, boiler making, rigging, etc. Mechanical Engineering Degree desirable but not necessary if otherwise qualified. Must be capable of doing work in the crafts themselves, also organizing, training, and supervising our Puerto Rican employees. Salary commensurate with experience and ability. Make application to E. G. Case, Vice-President, Manufacturing, Caribbean Refining Company, Box 2988, San Juan, Puerto Rico.

Manager field operations covering all phases of water well construction and large diameter rock drilling for industrial and municipal installations in the Midwest. Manager shall have qualifications to succeed retiring officer of company.

With first letter in applicant's handwriting give resume of education, employment and resident record during at least last five years and enclose photograph.

Box L-800
The Oil and Gas Journal
Tulsa, Oklahoma.

HELP WANTED

NEED FOREIGN sales representation for our complete line of new and revolutionary gas lift equipment. Excellent commissions. Box L-759, The Oil and Gas Journal, Tulsa, Oklahoma.

Representatives wanted by manufacturer of production equipment for Rocky Mountain, Four Corners, Illinois, Michigan, South America and Mexico. Give list of accounts now handled and method of coverage. Box L-779, The Oil and Gas Journal, Tulsa, Oklahoma.

TRANSLATORS, Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian. Send resume to: A•T•S, Inc., Drawer 271, East Orange, N.J.

MECHANICAL ENGINEER

Graduate Mechanical Engineer with minimum of four years experience in petroleum refinery or related engineering. Will be responsible for mechanical design and cost estimate of refinery processing equipment.

Duties will be closely integrated with operation of a modern, independent refinery which includes crude distillation, catalytic cracking, polymerization, coking, hydrosulfurization, catalytic reforming, alkylation, and utilities.

Send complete resume of education and experience, including salary requirements. All replies confidential.

GREAT NORTHERN
OIL COMPANY
P. O. Box 3596
St. Paul 1, Minnesota
ATTN: C. L. Dretzke

SUPERVISOR

Large Southern California independent oil company with modern refinery needs man to take responsible charge of all instrument and electrical maintenance work. Oil refinery maintenance experience desirable. Age 30-45. All replies confidential. Send resume of experience, qualifications and salary requirements to:

Personnel Manager
WILLSHIRE OIL CO.
OF CALIFORNIA
P. O. Box 2487
Santa Fe Springs, Calif.

DRILLING & MUD CONTROL ENGINEERS
RESERVOIR ENGINEERS

Large oil company operating in Iraq has openings for a number of young engineers experienced in Drilling and Mud Control, and also in Reservoir work. Good salary and working conditions.

Requirements:

A degree in Petroleum Engineering or Physics from a university of recognized standing.
A minimum of five years of practical experience in Drilling and Mud Control, or in Reservoir engineering.
The ability and inclination to train young Iraqi engineers.

If you can meet these requirements and if you want a job in the Middle East, send full particulars to Box L-802, The Oil and Gas Journal, Tulsa 1, Oklahoma.

HELP WANTED

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $6.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGICAL ENGINEER: Four years exploration geologist, four years oil, gas, and salt water disposal well drilling, completion, and workover. Desires job independent producer in production and/or geology. Box L-801, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING ENGINEER—U. S. or foreign, B. S. Geology, 2½ years Venezuela, 32, married. Box L-794, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Four years with major company is interested in relocating in Rocky Mountains or Alaska. Box L-796, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, M. S.; 37, 8 years subsurface with major in Mississippi and East Texas, ½ year surface in Durango. Victim of economic cutback, will relocate domestic or foreign. Box L-795, The Oil and Gas Journal, Tulsa, Oklahoma.

WAREHOUSE MAN, Materialsman: Age 35, married, 12 years Warehouse experience, Foreign & Domestic. Experienced Organizing, Administrative, Inventory Control, Personnel training, supervision and materials procurement for drilling and production programs. Box L-799, The Oil and Gas Journal, Tulsa, Oklahoma.

FIELD GEOLOGIST—Technical Writer. Husband-wife ready to begin careers as petroleum exploration geologist and technical writer respectively. He B.S. geology; she B.A. journalism. Currently he is an Air Force navigator; she is civilian editor of an Air Force wives' publication. Both some Spanish. Prefer Western States or foreign positions. Available June. Box 31 R 671, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

COMMERCIAL PILOT, 27 mel instrument 2,900 hrs. B-25, Convair, military obligation complete. BA ECO 1954 desire challenging position—executive pilot—public relations—available immediately. L. R. Kuhnell 7051 Twin Hills, Dallas, Texas, EM 1-1427.

PETROLEUM ENGINEER, also qualified as geologist. 17 years of responsible domestic and foreign experience. Speaks French and Spanish. Desires senior technical or administrative position in foreign operation of producing company. Box L-776, The Oil and Gas Journal, Tulsa, Oklahoma.

ADMINISTRATIVE secretary, 39, single, 10 years experience with major Venezuelan oil producer; desires relocate Latin America, but will consider other foreign employment. Box L-753, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES OR SALES Management: 18 years selling to drilling-production accounts, diversified equipment. Mostly Mid-Continent area. Management and administrative experience. Engineering background. Age 38. Presently employed. Box L-789, The Oil and Gas Journal, Tulsa, Oklahoma.

NATURAL GAS—
REFINING ENGINEER—
ECONOMIC ANALYST

Degree, 16 years balanced experience, domestic and foreign. Process design, natural gas, gasoline and refining operations. 4 years supervision engineering economics group—management services, evaluation, process selection, coordination, planning and economic justification of natural gas and petroleum processing facilities. Negotiation and analysis of purchase, sale, processing and joint venture agreements. 3 years coordinator of natural gas and natural gasoline operations with Venezuelan major. Supervision of operation and maintenance, off-shore gas turbine-centrifugal compressor, gas injection and absorption facilities.

710 Wayne Drive
Bakersfield, California

SITUATIONS WANTED

ENGINEER—GEOLOGIST Five years experience: Three years oil and gas field development and general production. Two years reservoir engineering and secondary recovery. Desires domestic employment, responsible position. Married, 32. Available April 25. Box 31 R 670, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

GAS ENGINEER with 8 years diversified experience in the oil and gas industry, both in domestic and foreign operations, desires challenging position with major or well integrated independent preferably in Texas. Experience includes Production Engineering, Drilling Engineering, Reservoir Engineering, Gas Operations, Construction, etc. Complete resume will be furnished upon request. Sales contact or manufacturers representative position will be considered. Box L-754, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 10 years major company field and staff assignments, including valuation, design and operation of water floods; unitization, reservoir engineering, commission work; and field problems and studies. Box L-787, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 42, married. 8 years foreign pipeline and construction experience in Middle East and North Africa. 16 years experience in refinery operation and construction domestic. Desire managerial position for major contractor or oil company in foreign operations continent or Libya. Presently employed. Box L-793, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

INDEPENDENT SOUTHERN Illinois Oil Co. completely equipped with rigs, etc., large drilling program, needs financial contact man full or part time. A rare opportunity for right man. Box L-778, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION Manufacturers: We have an Oil Tool Rental business with stores in Fillmore, Woodland, and Bakersfield, California. We have complete coverage of the oilfields of California with sales and service and would like to become the manufacturer's representative for several good oilfield lines. Rental Tools Corporation, P. O. Box 808, Bakersfield, California, Phone FA 4-9438.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

HAVE OIL AND GAS property, will exchange for investment stock in small reliable corp. Write: Box L-757, The Oil and Gas Journal, Tulsa, Oklahoma.

BRITISH COMPANY, well established and with good connections in the Oil Industry is prepared to represent American or Canadian manufacturers of specialty products for the Oil Industry. A Director will be visiting U.S.A. and Canada in early May and would be available to undertake preliminary discussions. Box L-797, The Oil and Gas Journal, Tulsa, Oklahoma.

FEDERAL OIL LEASES

You can benefit by our more than 25 years experience in your purchase of oil and gas leases. All leases chosen for good geological location where major companies are active. Parcels of 80 acres or more. Terms as low as $40 down, $20 per month for 9 months. 30 day money back privilege. Good inflation hedge. Free maps. Complete details. Write now.

ATLAS OIL SURVEY
Dept. OGJ-4, Colorado Bldg.
Denver 2, Colorado

BUSINESS OPPORTUNITIES

FINANCIAL Contacts, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant—817—51st Street, Brooklyn, N. Y.

ROYALTIES

HIGHEST PRICE paid for income royalties, overrides, oil properties. A. S. Berry, 109 Midco Bldg., 302 South Cheyenne, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

FOR SALE or drilling interest: Arizona oil and gas leases (Federal), Coconino County, 640 acres T17N, R13E, 586 acres T17N, R14E. Write: Box L-708, The Oil and Gas Journal, Tulsa, Oklahoma.

3,500 ACRES $2 per acre. Lawrence County, Ky. in midst of new gas play. Ten year leases in first year, ⅛ override, no drilling commitment, 50 cents per acre annual rental. U. S. Andersen, 8350 Santa Monica Blvd., LA 46.

HART COUNTY KENTUCKY, three proven adjoining leases, 700 foot drilling. Have geology and core analysis. First wells improperly completed. ⅞ interest, very reasonable price. Write Cambrian Petroleum Company Inc., 904 First National Bank Bldg., Lexington, Kentucky.

14 OIL WELLS, 5 water injection wells. 560 acres. Production, approximately 20 barrels daily. 700 ft. depth. On pipeline. Engineers say drilling additional wells will make a money making, long lived flood. Southeast, Kansas. Box L-715, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL NEEDED TO drill offset, to production in Montgomery County, Kansas. Will definitely drill to Wilcox at about 1,100 ft. Will test Bartlesville at about 750 feet. Charley C. Murphy, Box 8, Cherryvale, Kansas.

PROSPECTIVE OIL Land: Suitable townsite acreage in fee, E/35 acres, Sec. 16, Block JKL, PSL Survey, Hudspeth County, Texas, at intersection U. S. Highway 62 and F. M. 1437 Highway, south of Dell City, Texas. Write quickly, Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

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Suite 814 LOcust 3-6008

LEGAL

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 38.71 acres of land in one parcel within the undefined known geologic structure of the Tar Creek field, Wilkinson County, Mississippi, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., April 27, 1960 when bids will be opened. Full details of the lease offering and how and where to submit bids may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

PRODUCTION FOR SALE

THIRTY WELLS in North Lima field on 3 leases in Ottawa County and 1 lease Sandusky County, Ohio. Write John W. Richards, 106 Fifth Street, Genoa, Ohio.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 153.35 acres of land in two parcels within the known geologic structure of Moffat Field, Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., May 20, 1960, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. Dale R. Andrus, Land Office Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that 12,418.62 acres of land within five known geologic structures in the State of Montana and one known geologic structure in the State of North Dakota are offered for oil and gas leasing by competitive bidding. The structures, county in which located and area of land offered are as follows: RAGGED POINT field, Musselshell County, 240 Acres; GAS CITY field, Dawson County, 40 acres; KEVIN-SUNBURST field, Toole County, 2676.01 acres; CUT BANK field, Glacier County, 4.05 acres; BOWDOIN field, Phillips County, 9,420.04 acres, all located in Montana, and CEDAR CREEK field, Bowman County, North Dakota, 38.52 acres. The above lands will be offered to the qualified bidder of the highest cash amount per acre at 10 a.m. M.S.T., May 17, 1960, when bids will be opened. Description of the lands offered, details of the lease offering, how and where to submit bids, may be obtained from the Land Office, Bureau of Land Management, 1245 North 29th Street, Billings, Montana. Thomas H. Floyd, Jr., Manager, Land Office.

IF you change your address

please be sure to let us know promptly. It takes time to correct the stencil addressing plate. And we don't want you to miss copies of THE JOURNAL.

Also . . . . . .

be sure to give us both

(1) your OLD address

(including company)
and

(2) your NEW address

We need them both to make the change. Also confirmation of your company connection and position.

The Oil and Gas Journal

Box 1260 Tulsa, Okla.

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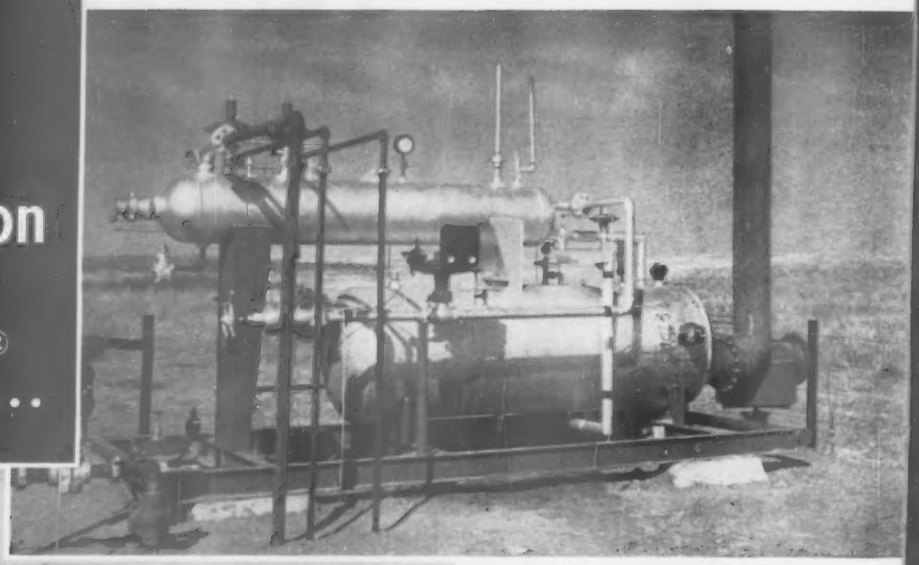
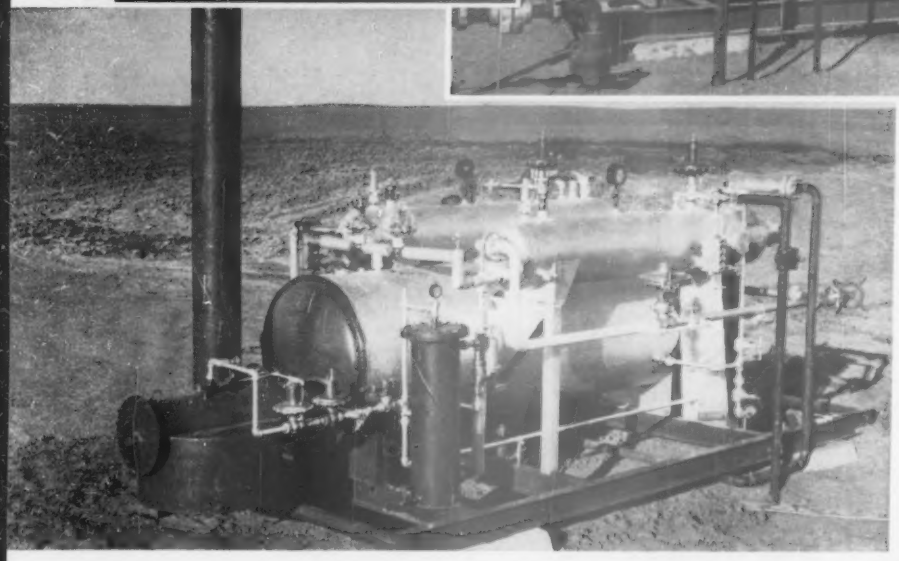
Another all new "Production Pak" by National®...





▲ Compact design and construction with built-in safety features assure the producer trouble-free operation.

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Use of a steam generator to heat the separator base and well stream in place of the conventional water bath heater method permits a higher MTD and less area requirement plus a convenient and dependable means of moving heat to the base of the separator.

Separator and generator are code stamped, and the unit is equipped with National's Flame Arrestor to prevent back flash.

These units have been proven in service in Oklahoma, Kansas and the Texas Panhandle.

National's Steam Generating Production Units are available in sizes from 2.5 MM cf/d to handle single, dual and triple completed wells.

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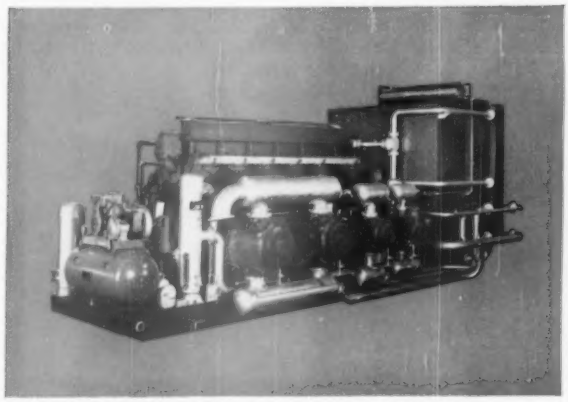
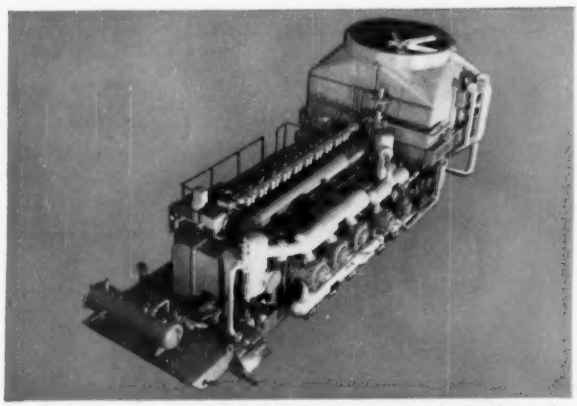
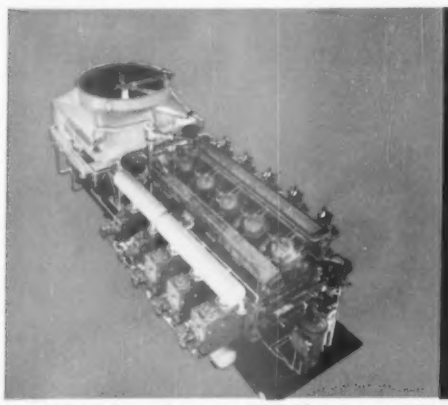


A 660 hp Ingersoll-Rand 12-SVG-2 compressor packaged by Southwest Industries, is in gas injection service in West Texas.



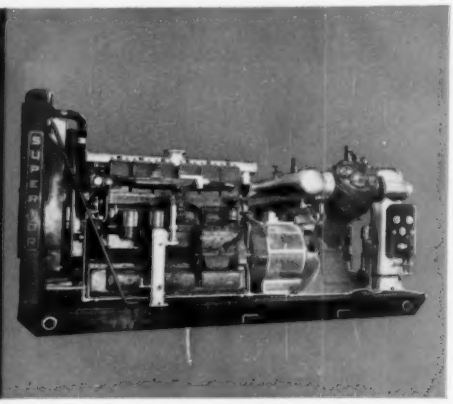
A Clark HMAB-10 compressor packaged by Southwest for a major oil company is in service for gas sales boosting in South Louisiana.



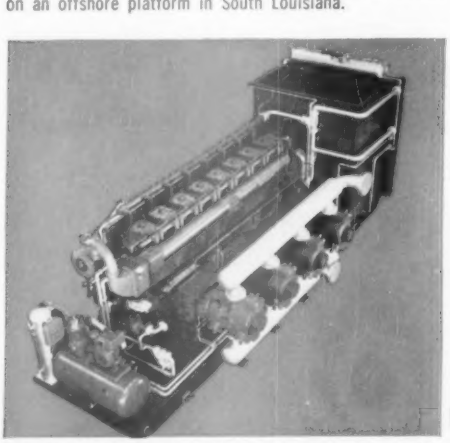
This 660 hp Cooper-Bessemer GMXD-10 compressor has been packaged by Southwest for gas gathering service on an offshore platform in South Louisiana.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19188, Houston 24, Texas



This 200 hp unit utilizing a Joy WB-12 compressor direct driven by a Superior 6G-510 Engine at 600 rpm was packaged by Southwest for propane service in a major oil company's gasoline plant.



This 750 hp Worthington SLHC-8 compressor in a Southwest Packaged Plant is being used by a major gas transmission company for pipeline boosting in East Texas.

PLANTS:
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Mexico, D.F., Mexico

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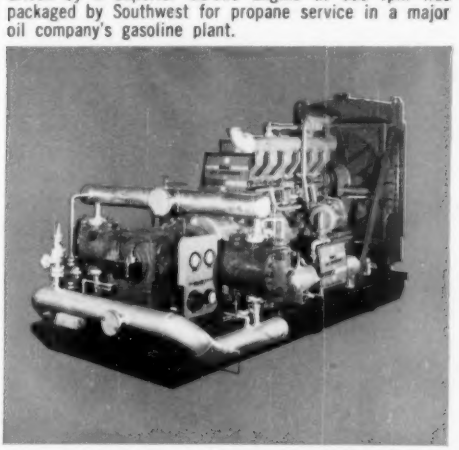
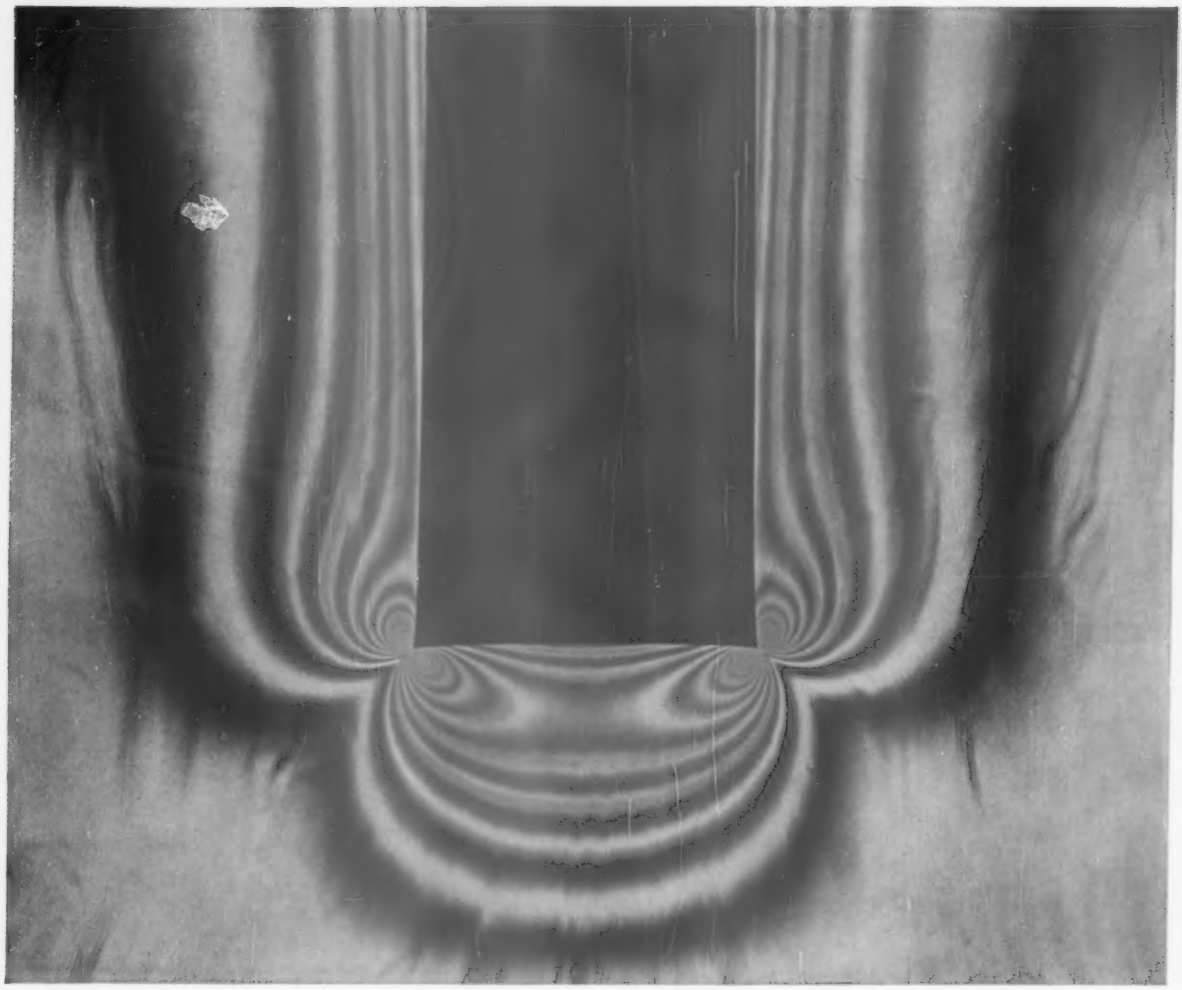


For a major gas transmission company, Southwest packaged this Ingersoll-Rand HHE-2 compressor with direct connection to a Waukesha LRORB Engine, operating at 1000 rpm and developing 250 hp.

Also designers and manufacturers of Packaged Natural Gasoline Plants, Packaged Inert Gas Generators, Packaged CO_2 and H_2S Removal Units.



● Well stresses studied for drilling clues

Determining stresses in wells drilled into the earth's crust is the objective of the mathematical and three dimensional photoelastic study being conducted by Hughes research engineers.

It is part of the continuing basic research program being carried on at Hughes to explore a wide range of possibilities for improving bit performance and drilling techniques.

In this study, a hole is drilled into a plastic casting and then forces, which simulate mud column and formation pressures, are applied. The resulting stress distribution is permanently maintained in the model by a technique known as the "Frozen Stress Method." A thin slice is taken from the model and viewed in polarized light. The photograph, above, shows one of these slices. Utilizing the principles of photoelasticity, information obtained from these slices may be used to calculate the stress conditions at any point.

Basic research, such as this, is continuing to extend the frontiers of our knowledge of conditions at the bottom of the hole, and is resulting in improved bit designs and further advances in drilling techniques.

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